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SUSQUEHANNA SES UNIT 1 CYCLE 4

STARTUP TEST SUMMARY

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ABSTRACT

Susquehanna Unit 1
Cycle 4
Startup Test Summary

Susquehanna Unit 1 resumed commercial operation for Cycle 4 on November 24, 1987 following a 10 week refueling and maintenance outage. The Unit 1 Cycle 4 (hereafter referred to as SIC4) reload included:

*	36	GE	8x8	initial core
	192	ANF	8x8	twice burned
	296	ANF	8x8	once burned
	240	ANF	9x9	unirradiated fuel assemblies

The following startup tests, identified in the SIC4 Reload Licensing Submittal, are discussed in this report:

1.0	Core Loading Verification and Audit
2.0	Control Rod Functional (Insert and Withdrawal Checks)
3.0	Subcritical Shutdown Margin Demonstration
4.0	In-Sequence Critical and Shutdown Margin Determination
5.0	TIP Asymmetry

In addition to the above mentioned tests, the startup program included a POWERPLEX input deck validation, scram time testing, core flow and LPRM calibrations, thermal limits monitoring and baseline recirculation data acquisition. A summary of these activities is also included in this report.

(ANF - Advanced Nuclear Fuels)

Susquehanna Unit 1
Cycle 4
Startup Test No. 1
Core Verification and Audit

Purpose

The purpose of this test is to visually verify that the core is loaded per the analyzed designs.

Criteria

Upon completion of core alterations during the refueling outage, the core must be verified to conform with the reference core design used in the various licensing analyses. The verifications to be performed include fuel bundle location, fuel bundle orientation, and proper seating of the fuel bundles within the core. The verifications will be performed by the Reactor Engineering Group utilizing an underwater television camera. The verification will be videotaped so that an independent verification may be performed. Any discrepancies discovered in the loading will be promptly corrected and the affected bundles shall be reverified prior to unit startup.

Results

The U1C4 core was analyzed to have a 1.38% $\Delta K/K$ shutdown Margin with the strongest rod fully withdrawn at BOC 4. (Startup and Operations Letter Report, Susquehanna Unit 1 Cycle 4). This figure was significantly less than previous cycles, therefore the following precautions were taken to prevent a misloaded fuel bundle. During the offload all bundles were placed in the fuel pool in the order in which they were to be reloaded, a pool verification was performed (10/7/87) of all fuel before the reload commenced and a partial core verification was performed (10/22/87) after all irradiated bundles were placed in the core, before any new fuel was loaded.

The Cycle 4 final core verification consisted of two videotaped passes over the core. During the first pass, the fuel bundle serial numbers were recorded on the videotape to verify proper location. The second pass was performed to verify proper fuel assembly seating (assembly height check) and correct orientation.

The core tapes were independently verified to be correct by the Reactor Engineering Supervisor and a representative of Quality Control on 10/27/87. Therefore, the as-loaded core configuration is consistent with the core design Advanced Nuclear Fuels used in the evaluation of the SIC4 Reload Licensing Analyses. The SIC4 core map is included as Figure 1.

	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
60									LJN415	XN1151	XN1104	XN1101	XN1036	XN1027	LJU203
58								LJN104	X12224	X12319	X12270	X12315	X12295	X12334	X12277
56						LJN042	XN1072	X12225	XN1069	X12231	X13489	X12294	X13490	X12292	X13491
54						XN1188	X12308	X13495	X12306	X13496	X12242	X13497	X12232	X13498	X12266
52					LJT014	X12215	XN1187	X12205	X13503	X12305	X12256	X12280	X13504	X12254	X13505
50			LJN046	XN1192	X12304	X13509	X12244	X13510	X12255	X13511	XN1089	X13512	XN1138	X13513	XN1055
48			XN1102	X12321	XN1106	X12331	X13519	X12303	X12332	X12200	X13520	X12265	X12214	X12234	X13521
46		LJN388	X12216	X13525	X12241	X13526	X12199	X13527	XN1189	X13528	XN1017	X13529	XN1031	X13530	XN1070
44	LJN389	X12278	XN1191	X12281	X13537	X12279	X12282	XN1149	XN1109	X12193	X13538	XN1056	X13539	XN1050	X13540
42	XN1159	X12307	X12213	X13545	X12246	X13546	X12329	X13547	X12197	X13548	X12318	X13549	XN1156	X13550	XN1105
40	XN1190	X12333	X13557	X12207	X12293	XN1080	X13558	XN1019	X13559	X12257	XN1103	X12289	X12267	X12235	X13560
38	XN1129	X12194	X12268	X13565	X12258	X13566	X12206	X13567	XN1110	X13568	X12253	X13569	XN1059	X13570	XN1137
36	XN1124	X12269	X13577	X12330	X13578	XN1037	X12223	XN1049	X13579	XN1158	X12226	XN1015	XN1067	X12243	X13580
34	XN1071	X12320	X12245	X13585	X12290	X13586	X12233	X13587	XN1122	X13588	X12217	X13589	X12317	X13590	X12316
32	LJN082	X12198	X13597	X12291	X13598	XN1117	X13599	XN1136	X13600	XN1081	X13601	XN1066	X13602	X12208	XN1004
30	LJN423	X12478	X13609	X12381	X13610	XN1150	X13611	XN1123	X13612	XN1024	X13613	XN1006	X13614	X12472	XN1005
28	XN1047	X12358	X12433	X13621	X12380	X13622	X12443	X13623	XN1131	X13624	X12463	X13625	X12355	X13626	X12354
26	XN1119	X12409	X13633	X12342	X13634	XN1041	X12451	XN1107	X13635	XN1083	X12454	XN1054	XN1086	X12431	X13636
24	XN1028	X12486	X12408	X13641	X12422	X13642	X12470	X13643	XN1084	X13644	X12417	X13645	XN1076	X13646	XN1029
22	XN1085	X12345	X13653	X12471	X12383	XN1033	X13654	XN1060	X13655	X12421	XN1003	X12379	X12407	X12445	X13656
20	XN1007	X12371	X12459	X13661	X12434	X13662	X12341	X13663	X12477	X13664	X12356	X13665	XN1132	X13666	XN1020
18	LJN392	X12394	XN1095	X12397	X13673	X12395	X12398	XN1133	XN1075	X12485	X13674	XN1058	X13675	XN1008	X13676
16		LJN393	X12462	X13681	X12429	X13682	X12479	X13683	XN1154	X13684	XN1177	X13685	XN1091	X13686	XN1030
14			XN1121	X12359	XN1134	X12343	X13693	X12367	X12344	X12480	X13694	X12405	X12460	X12444	X13695
12			LJN459	XN1092	X12368	X13699	X12432	X13700	X12419	X13701	XN1073	X13702	XN1108	X13703	XN1057
10					LJS985	X12461	XN1127	X12469	X13709	X12369	X12420	X12396	X13710	X12418	X13711
8						XN1153	X12372	X13715	X12370	X13716	X12430	X13717	X12442	X13718	X12406
6						LJN463	XN1048	X12453	XN1032	X12441	X13723	X12384	X13724	X12382	X13725
4								LJN395	X12452	X12357	X12410	X12353	X12385	X12346	X12393
2									LJN416	XN1125	XN1026	XN1099	XN1016	XN1152	LJS954

FIGURE 1. SUSQUEHANNA UNIT 1 CYCLE 4 CORE LOADING

	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59
60	LJU206	XN1178	XN1171	XN1185	XN1142	XN1130	LJS824								
58	X12288	X12335	X12296	X12328	X12271	X12324	X12229	LJS845							
56	X13492	X12299	X13493	X12297	X13494	X12240	XN1088	X12228	XN1096	LJS783					
54	X12275	X13499	X12239	X13500	X12251	X13501	X12311	X13502	X12309	XN1148					
52	X13506	X12263	X13507	X12285	X12261	X12312	X13508	X12212	XN1140	X12220	LJU173				
50	XN1170	X13514	XN1051	X13515	XN1023	X13516	X12262	X13517	X12249	X13518	X12313	XN1077	LJS785		
48	X13522	X12237	X12221	X12276	X13523	X12201	X12337	X12314	X13524	X12338	XN1100	X12322	XN1157		
46	XN1087	X13531	XN1040	X13532	XN1053	X13533	XN1111	X13534	X12202	X13535	X12252	X13536	X12219	LJS847	
44	X13541	XN1169	X13542	XN1164	X13543	X12196	XN1162	XN1120	X12283	X12286	X13544	X12284	XN1082	X12287	LJS848
42	XN1064	X13551	XN1046	X13552	X12325	X13553	X12204	X13554	X12340	X13555	X12247	X13556	X12222	X12310	XN1145
40	X13561	X12236	X12274	X12302	XN1166	X12260	X13562	XN1014	X13563	XN1163	X12298	X12210	X13564	X12336	XN1022
38	XN1147	X13571	XN1093	X13572	X12264	X13573	XN1144	X13574	X12211	X13575	X12259	X13576	X12273	X12195	XN1165
36	X13581	X12250	XN1034	XN1090	X12227	XN1112	X13582	XN1052	X12230	XN1043	X13583	X12339	X13584	X12272	XN1126
34	X12327	X13591	X12326	X13592	X12218	X13593	XN1180	X13594	X12238	X13595	X12301	X13596	X12248	X12323	XN1097
32	XN1002	X12209	X13603	XN1062	X13604	XN1035	X13605	XN1116	X13606	XN1115	X13607	X12300	X13608	X12203	LJS817
30	XN1063	X12473	X13615	XN1074	X13616	XN1118	X13617	XN1135	X13618	XN1182	X13619	X12390	X13620	X12483	LJS918
28	X12365	X13627	X12364	X13628	X12464	X13629	XN1146	X13630	X12448	X13631	X12391	X13632	X12436	X12361	XN1044
26	X13637	X12438	XN1009	XN1078	X12455	XN1183	X13638	XN1139	X12458	XN1176	X13639	X12351	X13640	X12412	XN1114
24	XN1012	X13647	XN1094	X13648	X12428	X13649	XN1184	X13650	X12475	X13651	X12423	X13652	X12413	X12487	XN1013
22	X13657	X12446	X12414	X12392	XN1021	X12424	X13658	XN1065	X13659	XN1038	X12388	X12474	X13660	X12348	XN1010
20	XN1025	X13667	XN1098	X13668	X12363	X13669	X12484	X13670	X12352	X13671	X12435	X13672	X12468	X12374	XN1181
18	X13677	XN1061	X13678	XN1168	X13679	X12488	XN1161	XN1155	X12399	X12402	X13680	X12400	XN1011	X12403	LJS851
16	XN1001	X13687	XN1175	X13688	XN1079	X13689	XN1172	X13690	X12482	X13691	X12440	X13692	X12465	LJS852	
14	X13696	X12447	X12467	X12416	X13697	X12481	X12349	X12378	X13698	X12350	XN1160	X12360	XN1128		
12	XN1143	X13704	XN1042	X13705	XN1068	X13706	X12426	X13707	X12437	X13708	X12377	XN1018	LJS887		
10	X13712	X12427	X13713	X12401	X12425	X12376	X13714	X12476	XN1173	X12466	LJT001				
8	X12415	X13719	X12449	X13720	X12439	X13721	X12375	X13722	X12373	XN1186					
6	X13726	X12389	X13727	X12387	X13728	X12450	XN1039	X12456	XN1045	LJS878					
4	X12404	X12347	X12386	X12366	X12411	X12362	X12457	LJS854							
2	LJS957	XN1179	XN1141	XN1167	XN1174	XN1113	LJS825								

FIGURE 1. SUSQUEHANNA UNIT 1 CYCLE 4 CORE LOADING

Susquehanna Unit 1
Cycle 4
Startup Test No. 2
Control Rod Functional (Insert and Withdrawal Checks)

Purpose

The purpose of this startup test is to assure proper control rod function and demonstrate that criticality will not occur due to the withdrawal of a single rod.

Criteria

Control Rod Functionals include mobility, overtravel and subcritical checks. These may be performed as each control cell is loaded in its final configuration.

Each control rod will be cycled individually to ensure mobility. As each rod is fully withdrawn, it will be checked for overtravel by continually applying a withdrawal signal. Subcriticality will also be verified with the rod withdrawn.

Results

Due to Shutdown Margin considerations, no control rod functionals were performed on fully loaded control cells until the partial core verification was completed on 10/22/87. No control rods overtraveled and subcriticality was maintained as each rod was individually fully withdrawn and reinserted.

Susquehanna Unit 1
Cycle 4
Startup Test No. 3
Subcritical Shutdown Margin Demonstration

Purpose

The purpose of this startup test is to assure at least the minimum required shutdown margin exists with the strongest worth control rod fully withdrawn.

Criteria

The minimum required shutdown margin at BOC for Susquehanna Unit 1 Cycle 4 is 0.75% Δ K/K. This test will verify at least this amount by performance of a subcritical shutdown margin demonstration. The highest (strongest) worth control rod is fully withdrawn, then a diagonally adjacent rod is slowly notched out verifying subcriticality at each step until the analytically determined reactivity worth of the control rods at their respective notch position equals or slightly exceeds the required amount of SDM.

Results

The reactor remained subcritical with the highest worth control rod fully withdrawn and an additional diagonally adjacent rod pulled to a notch position with a calculated worth of 1.143% Δ K/K. The required shutdown margin to be demonstrated was calculated to be 1.042% Δ K/K. This is .75% Δ K/K plus a correction factor for the recirculation loop temperature (141 degrees F) at the time of the test. Using data supplied by ANF it was determined that the following rods pulled to the indicated position would demonstrate a shutdown margin of 1.143% Δ K/K.

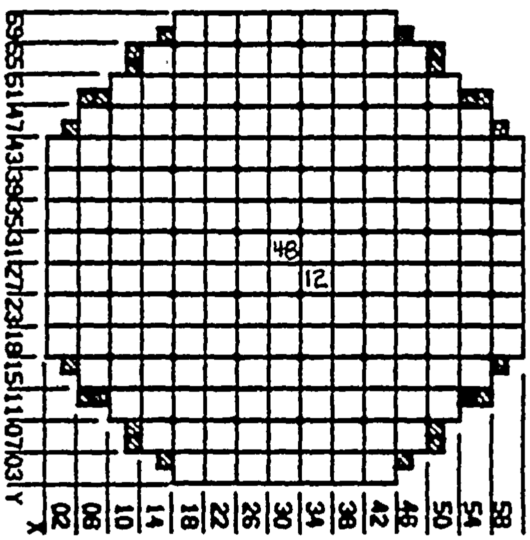
ROD	POSITION	TOTAL WORTH % Δ K/K
30-31*	48	-
34-27	12	1.143

*analytically determined strongest rod.

Due to the preliminary BOC SDM calculation of 1.38% Δ K/K, precautions were taken during the performance of this test to reduce individual rod notch worths. Overtravel checks were performed on both rods and the notch-down procedure was used to minimize the effect of the high incremental notch worths of the adjacent rod.

As rods were pulled, subcriticality was verified after each notch. Subcriticality was also verified with the rods at the above indicated positions, thus satisfying the purpose of this startup test. Figure 2 is a core map showing the test rod positions.

FIGURE 2. CORE MAP SHOWING TEST ROD POSITIONS FOR SUBCRITICAL SHUTDOWN MARGIN DEMONSTRATION



Susquehanna Unit 1
Cycle 4
Startup Test No. 4
In-Sequence Critical and SDM Determination

Purpose

The purpose of this startup test is to calculate the actual shutdown margin of the cycle 4 core and to demonstrate that no reactivity anomaly existed.

Criteria

1) Shutdown Margin

Technical Specification 3.1.1 requires an adequate shutdown margin to ensure the reactor can be made subcritical from all operating conditions. This value, .38% Δ K/K has been determined to be the minimum requried SDM to bring a reactor subcritical under the worst case conditions - a cold, xenon-free core at the most reactive point in the cycle with the highest worth control rod unavailable for reactivity control. At beginning of cycle, the required SDM value must be increased by a factor, R, if it is determined that core shutdown margin is less at another point in the cycle than the initial shutdown margin (for Cycle 4, R = 0). A prediction uncertainty of .37% Δ K/K is also added at BOC to assure the validity of the analytical calculations. The required beginning-of-cycle SDM for Susquehanna Unit 1 Cycle 4 is 0.75% Δ K/K; the actual SDM will be calculated from data obtained during the initial startup criticality.

2) Reactivity Anomaly

Core reactivity is monitored to prevent excessive reactivity additions due to unforeseen reactivity changes or reactivity anomalies. At BOC, a 1% Δ K/K difference between predicted and actual critical control rod positions might indicate improper core loading or a computer code that is unreliable. Data gathered during the in-sequence critical, specifically the Keff at the notch position of the control rod at which criticality occurs is compared to predicted critical control rod position Keff and a % reactivity difference is calculated.

Results

The calculated SDM was 1.46% Δ K/K and the difference between actual Keff and predicted Keff at criticality was 0.08% Δ K/K.

Control rods were withdrawn in the B sequence until the reactor was on a stable, positive period. The notch position at which criticality concurred was rod 38-47, notch 18, step 35. A special log was initiated to record SRM count rates and recirculation loop temperatures. The average period was 194 seconds and the average loop temperature 153.5 degrees F which yield period and temperature corrections of .332 10^{-3} Δ K/K and 3.42 x 10^{-3} Δ K/K respectively.

1) Shutdown Margin

The equation used to calculate SDM

$$SDM = \frac{Kcrit - Ksro}{Kcrit * Ksro} - \Delta p \text{ (period)} - \Delta p \text{ (temp)}$$

Kcrit is Keff at the actual critical control rod position (1.00457) and Ksro is Keff predicted with the strongest rod out (0.98642)

The minimum required SDM for Unit 1 Cycle 4 at beginning of cycle was 0.75% ΔK/K; the calculated shutdown margin based on this test was 1.46%ΔK/K, thus satisfying the acceptance criteria.

2) Reactivity Anomaly

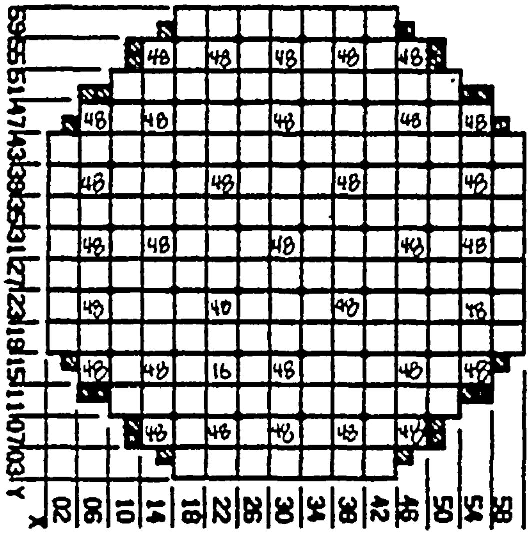
The reactor went critical at step 35 with Kcrit of 1.00457. The equation used to calculate reactivity difference was

$$\text{Reactivity difference} - \frac{Kcrit - 1}{Kcrit} - \Delta p \text{ (period)} - \Delta p \text{ (temp)}$$

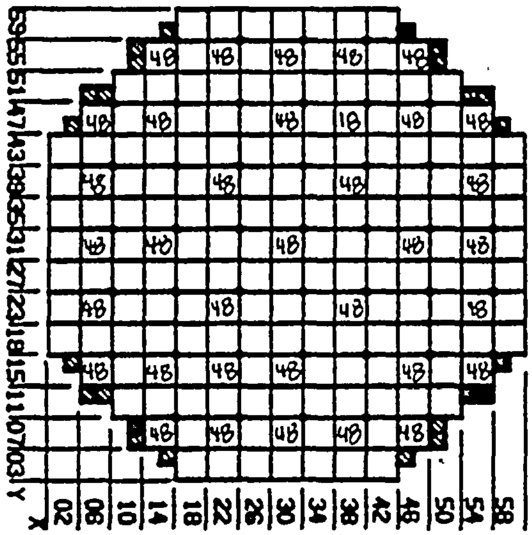
The calculated reactivity difference was 0.08%ΔK/K. This satisfies ± 1%ΔK/K acceptance criteria.

A comparison of the predicted versus actual critical control rod patterns is included as Figure 3.

FIGURE 3. COMPARISON OF PREDICTED VS ACTUAL CRITICAL ROD PATTERNS



PREDICTED CRITICAL PATTERN



ACTUAL CRITICAL PATTERN

Susquehanna Unit 1
Cycle 4
Startup Test No. 5
Tip Asymmetry

Purpose

The purpose of this test is to check core symmetry by performing a statistical uncertainty analysis on the Traversing In-Core Probe (TIP) System. Also, by the performance of this test, the proper operation of the TIP system will be assured.

Criteria

The X^2 test of significance will be performed with the significance level fixed at 1%. The test will be performed utilizing an octant symmetric rod pattern at a power level greater than 75% of rated power. The startup test criteria for symmetric TIP differences is that the X^2 value calculated shall be less than the critical X^2 value. Since Susquehanna has 19 symmetric TIP pairs, the calculated X^2 value must be less than a critical X^2 value of 36.19 (as determined by ANF). If the calculated X^2 value exceeds the critical value, the instrumentation and data processing system should be reviewed for any problems which may contribute to abnormal TIP asymmetries. A second determination of X^2 should be then made. If the new measured value of X^2 exceeds the critical value, the fuel vendor shall be consulted and appropriate action taken to assure that a larger than anticipated TIP asymmetry does not adversely affect the safe operation of the reactor.

Results

A complete set of TIP data was obtained at the completion of Susquehanna Unit 1 BOC4 Startup Testing Program at rated thermal power. The nodal TIP values (Nodes 3 through 22) were summed up for each symmetric TIP pair using equation 5.1 with the results summarized in Table 1. Using Equations 5.2 and 5.3, the variance and X^2 were calculated to be 4.96 and 2.62 respectively. The X^2 value of 2.62 is well within the 36.19 limit established by ANF.

Table 1
Absolute Relative Difference

Symmetric TIP Pair	Absolute Relative Difference dm
1	1.04
2	3.08
3	4.35
4	3.22
5	6.57
6	1.92
7	0.02
8	0.02
9	6.15
10	1.89
11	3.61
12	0.98
13	0.94
14	3.27
15	0.85
16	2.07
17	3.45
18	0.18
19	4.22

Equation 5.1

$$dm = \frac{100\ (Tm1 - Tm2)}{\left(\frac{Tm1 + Tm2}{2}\right)}$$

Note: $Tm1 = \sum_{K=3}^{22} T(k)$ for TIP_1 and $Tm2 = \sum_{K=3}^{22} T(k)$ for TIP_2

where TIP_1 and TIP_2 are symmetric TIP pairs

Equation 5.2 (Variance)

$$S^2 TIP_{ij} = \frac{\sum_{M=1}^{19} dm^2}{36} = 4.96$$

Equation 5.3

$$X^2 = \frac{19\ S^2 TIP_{ij}}{36} = 2.62$$

Susquehanna Unit 1
Cycle 4
Startup Program Summary

Rod Scram Time Testing

Purpose

To demonstrate the maximum scram insertion times of all rods following core alterations.

Criteria

Susquehanna Technical Sepcification 4.1.3.2 states that scram insertion times of all control rods shall be demonstrated through measurement with reactor coolant pressure greater than 950 psig prior to exceeding 40% thermal power after core alterations. For Unit 1 cycle 4, one-half of all control rods scram times were to be determined by performing a black-and-white scram from the B sequence and using GETARS scram data. The remaining rods were to be individually scram time tested.

Results

Due to a GETARS software problem, control rod scram times from the black-and-white scram wre not printed out directly, but had to be calculated from the GETARS stored files. The remaining rods were individually scram timed November 25-26, 1987.

All control rod scram insertation times were determined to be within Technical Specification limits. The results are included as Table 2.

	ROD	ROD POSITION	TIME AS FOUND	T.S. LIMIT
MAXIMUM INDIVIDUAL ROD SCRAM INSERTION TIME T.S. 3.1.3.2	26-27	05	3.36	7.00
AVERAGE SCRAM INSERTION TIME OF OPERABLE RODS T.S.3.1.3.3		45	0.34	0.43
		39	0.65	0.86
		25	1.40	1.93
		05	2.50	3.49
AVERAGE SCRAM INSERTION TIME OF SLOWEST 2x2 ARRAY T.S. 3.1.3.4		45	0.36	0.45
		39	0.71	0.92
		25	1.55	2.05
		05	2.71	3.70

TABLE 2: Results of Scram Time Testing of All Control Rods S1C4.

Susquehanna Unit 1
Cycle 4
Startup Program Summary

POWERPLEX INPUT DECK VALIDATION

Purpose

To ensure the POWERPLEX input deck is updated correctly before the start of every new fuel cycle.

Criteria

POWERPLEX is the ANF software system designed to perform in-core monitoring of BWR cores. Core monitoring is performed by the module, XTGBWR, a three-dimensional reactor simulator code which calculated bundle nodal powers. The POWERPLEX input deck consists of all constants needed for the execution of this code and subsequent calculation of the margin to thermal limits. These constants must be updated prior to the start of every new fuel cycle in order to ensure satisfactory core monitorings of the new core configuration. The deck is updated by an ANF core management engineer and validated jointly by members of the Reactor Engineering Group at Susquehanna and the Nuclear Fuels Group in Allentown.

Results

The POWERPLEX input deck was verified to be correct and successfully loaded into the POWERPLEX system prior to SIC4 startup.

Susquehanna Unit 1
Cycle 4
Startup Program Summary

The following is a short summary of additional Reactor Engineering activities performed during the Startup Testing Program.

Thermal Limit Monitoring

Thermal Limits were checked throughout the startup period through review of the POWERPLEX core monitoring program, MONITOR, output. At no time did thermal limits exceed Technical Specification limits.

TIP System - OD-1 Performance

A full set of TIPS was run at 30% power to update the core power distribution before the first core performance calculation was initiated. Subsequent TIP sets were performed at 70 and 100% power in conjunction with two LPRM calibrations. The LPRM currents were updated and the LPRM GAFS found to be with the acceptable range.

Power Distribution Comparison with Offline Monitoring

Favorable results were obtained when actual core power distribution data was compared to SIMULATE core modelling code data. The SIMULATE code is used by the Nuclear Fuels core management engineer to predict power distributions throughout the cycle. This comparison, at 0.242 GWD/MTU is included as Figure 4.

Core Flow Calibration

A core flow calibration was performed at 97% core flow. Jet pump and recirculation loop flow instrumentation was adjusted to ensure correct core flow indication and correct calculation of the flow biased rod block and scram setpoints by the APRM flow units.

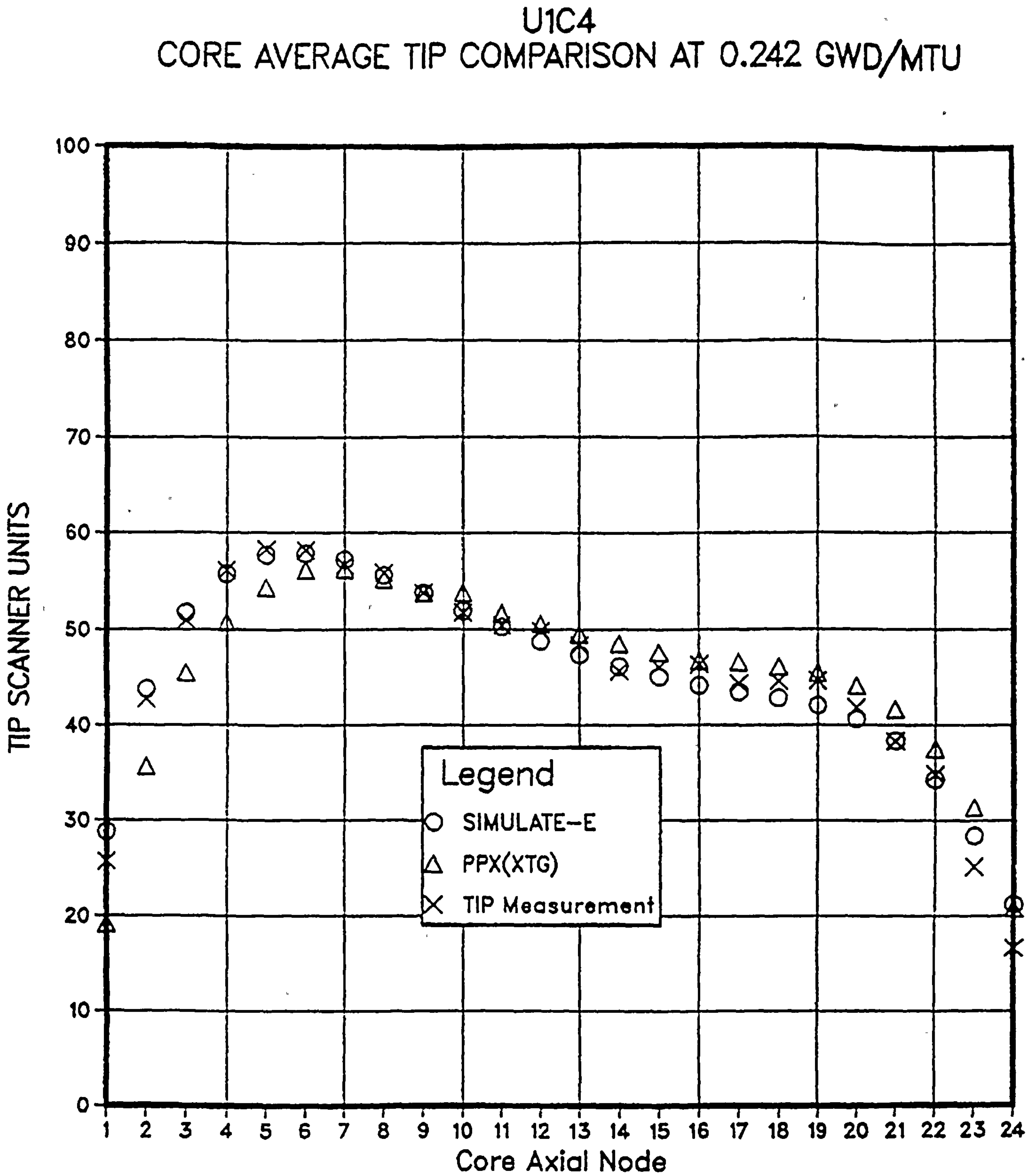
Recirculation Loop Baseline Data Acquisiton

Recirculation loop data was collected throughout the startup program to provide baseline data for plant performance monitoring in two loop and single loop operation. This data is used throughout the cycle during the performance of the technical section Jet Pump Operability Surveillance.

Neutron Noise Baseline Data Recording

APRM and LPRM baseline neutron flux noise data was collected as outlined in Technical Specification 4.4.1.1.1.4. This data was analyzed and incorporated into the Neutron Flux Noise Level Recording surveillance.

FIGURE 4


U1C4
CORE AVERAGE TIP COMPARISON AT 0.242 GWD/MTU
TIP SCANNER UNITS
0
10
20
30
40
50
60
70
80
90
100
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Core Axial Node
Legend
SIMULATE-E
PPX(XTG)
TIP Measurement

Pennsylvania Power & Light Company

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FEB 22 1988

Harold W. Keiser
Vice President-Nuclear Operations
215/770-7502

Mr. William T. Russell
Regional Administrator-Region 1
U.S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

SUSQUEHANNA STEAM ELECTRIC STATION
UNIT 1 STARTUP REPORT
PLA-2984 FILE R41-2A Docket No. 50-387

Dear Mr. Russell:

Attached is a copy of the Susquehanna SES Unit 1 Startup Report for the Unit 1 Cycle 4 startup. This report is submitted in accordance with Technical Specifications Section 6.9.1.1 through 6.9.1.3. The report addresses those startup tests described in our application for reload dated June 19, 1987 (PLA-2875).

Very truly yours,

H. W. Keiser
Vice President-Nuclear Operations

Attachment

cc: NRC Document Control Desk (w/original)
NRC Region I
Mr. M. C. Thadani - NRC Project Manager
Mr. F. I. Young - NRC Resident Inspector

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