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CYCLE 6 START-UP TEST REPORT

Cyclo 6 operations commenced September 2, 1983 ending a 90 day refueling cutage. The start-up physics test program was conducted from September 1, 1983 through November 5, 1983 utilizing Reactor Analyst Procedure 7.1.17 titled Refuel Start-up Program, Revision 6.

CORE LOADING AND VERIFICATION

Two hundred new fuel assemblies designated LY4857-LY5056 were loaded during the refueling outage. Three hundred and sixty irradiated fuel assemblies designated LJB, LJM, LJX, and LJZ were shuffled to new locations. The final loading map is attached as Figure 1.

Core verification was performed in accordance with RAP 7.2.4 ur ng an underwater T.V. camera to verify proper fuel assembly location, orientation, and seating.

CONTROL ROD DRIVE TESTS

Prior to start-up, surveillance test F-ST-23B, Control Rod Coupling Integrity Test, was satisfactorily completed on all 137 control rods.

Prior to reaching 40% rated core thermal power, control rod scram time testing was conducted. The results are tabulated below.

Observed Limit (Secs.) 137 F	1003 (3003.)
46 .338	.325
.923	.736
	1.476
04 3.554	2.586

The average of the scram insertion times for the three fastest operable control rods for all groups of four control rods in a two by two array were less than the maximum times allowed by the technical specifications.

SHUTDOWN MARGIN TEST

"Criticality" was achieved on September 2, 1983, on the 11th rod of rod sequence control system group number 2, notch position 14, with reactor temperature at 145°F and a period of 213 seconds. The shutdown margin was calculated to be 1.05% ΔK exceeding the technical specification of 0.38% ΔK + R. By referencing the cycle management report provided by the vendor, the moderator temperature coefficient was determined to be - 2.21 x 10^{-5} ΔK /°F, the period correction factor 3 x 10^{-4} ΔK , and the value of R (maximum decrease in shutdown margin) = 0.0.

REACTIVITY ANOMALY

A comparison of the expected and actual control rod density was performed at 100% core thermal power and 96.7% rated core flow. The actual control rod inventory was 268 notches inserted, and the predicted inventory was 360 notches inserted. The \pm 1% Δ K reactivity boundaries were 53 (-1% Δ K) and 653 (+ 1% Δ K) notches inserted.

8312060274 831118 PDR ADOCK 05000333 P PDR

POWER DISTRIBUTION MEASUREMENTS

Core power distribution was monitored throughout the start-up using the process computer. During the ascension to full power, six LPRM calibrations were performed at 26%, 35%, 57%, 64%, 90%, and 100% core thermal power. Reactor core thermal limits were maintained within technical specifications.

TIP REPRODUCIBILITY

A traveling incore probe reproducibility test was performed at 100% power, and the total uncertainty was calculated to be 3.09%,, well below the 8.7% assumed by the vendor.

CORE POWER SYMMETRY

Core power symmetry was checked at 30%, 50%, 75%, and 100% power. The maximum difference in power level of symmetrically located fuel bundles was found to be less than 10%.

LPRM RESPONSE TEST

Nine LPRMs were replaced during the refueling outage, and a test to verify that the LPRMs are connected to the correct flux amplifier was performed using RAP 7.3.8. The LPRMs responded satisfactorily to control rod movement.

CORE FLOW EVALUATION

Two core flow evaluations were performed at 100% thermal power. The value for total core flow provided by the instrumentation was found to agree within 1% with the value calculated by the jet pump calibration program.

PROCESS COMPUTER CHECKOUT

The vendor supplied, and came to the site, to load the data classes for cycle 6. Tests were performed to ensure the data classes were loaded properly. Core performance calculations were made using the BUCLE program at 35%, 50%, 75%, and 100% core thermal power. In each case, the location and the value calculated for MFLCPR, MFLPD, and MAPRAT agreed very closely.

PRESSURE REGULATOR TEST

The pressure regulator test, RAP 7.3.18 verified that the decay ratio of the reactor pressure transient caused by a 10 psi change in the pressure set-point for each pressure regulator is less than 1.0.

DETERMINATION OF RATED DRIVE FLOW

In conjunction with the core flow e to deta was obtained to determine rated drive flow. The result was (a) $\frac{1}{2}$ to be 33.51 x 10⁶ lb/hr.

TIP AXIAL ALIGNMENT

A test to verify the proper alignment of the traveling incore probe system was performed, and the results showed the axial alignment to be satisfactory.

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LUM LUM LUM LUM LUM
                                                    525 475 550 580 585
                                                                                   39 565 598 535 563
 52
                                              LJM LJX LJX LJX LJX LY4 LY4 LJX LJX LJX LJX LJX
                                              497 881 946 954 986 986 951 957 977 948 974 494
                             LUB LUM LUX LUX LUX EY4 LUM LY4 LUX LUX LY4 LUM LY4 LUX LUX LUX LUM LUB
                             308 514 895 888 885 984 540 945 953 882 876 545 915 920 979 916 524 338
                       LJB LJX LJX LY4 LJX LY5 LJZ LY4 LJZ LY4 LY5 LJZ LY5 LJZ LY4 LJX LY4 LJX LJX LJB
                                  924 977 939 013 053 884 042 897 001 012 012 029 974 983 870 921 905 327
                  LJB LJX LJM LY4 LJX LY4 LJM LY4 LJM LY4 LJM LJH LJH LJH LJH LJH LJX LY5 LJM LJX LJB
                 314 941 577 989 913 992 564 998 556 908 522 543 888 570 882 559 860 993 039 552 978 344
                  LJM LJX LYS LJX LY4 LJZ LY4 LJZ LY4 LJZ LY4 LJZ LY4 LY5 LJZ LY4 LJZ LY4 LJZ LY4 LJX LY4 LJX LJM
                  557 880 022 989 905 055 963 040 886 041 863 054 045 901 028 970 050 955 914 969 949 601
                  LIX LY4 LIX LY4-LJM LY4-LJM LY4-LJM LY4-LJM LY4-LJM LY4-LJM LY4-LJM LY4-LJM-LY4-LJX-LY4-LJX
                  988 996 899 969 471 865 581 966 538 987 469 451 914 547 944 669 946 467 889 877 862 917
            LJM LJX LJX LY4 LJZ LY4 LJX LY4 LJZ LY4 LJZ LY4 LJX LY4 LY5 LJX LY5 LJZ LY5 LJX LY4 LJZ LY5 LJX LJX LJM
           492 955-892-913 007-893 879-864-049-978-930-993 033 928 036 034 037 886 996 032 035-981-919 533
.. 38
      LUM LUX LUX LYS LUM LYS LUM LY4 LUM LUX LUM LY4 LUM LUM LY4 LUM LUX LUM LY5 LUM LY5 LUM LY4 LUX LUX LUM
                             528 882 569 867 478 991 476 987 456 459 983 592 876 452 848 526 888 598 937 958 97 546
                       007
      LJM LJX LY4 LJZ LY4 LJZ LY4 LJZ LJX LJM LY4 LJX-LY5 LY4 LJX LY5 LJM LJX LJZ LY4 LJX LY4 LJZ LY4 LJZ LY4 LJX LJM
 34 537 990 894 020 861 003 857 047 931 504 859 937 016 957 960 010 591 980 013 935 996 948 052 949 915 542
      LJM LJX LJM LYS LJM LY4 LJM LY4 LJM LY5 LJM LY4 LJM LY5 LJM LY4 LJM LY5 LJM LY4 LJM LY5 LJM LJX LJM
 32 484 910 558 005 602 932 579 933 510 003 578 934 501 582 041 503 883 599 049 607 942 572 043 562 911 573
      LJM LJX LY4 LJZ LY4 LJZ LY5 LJX LY4 LJX LY4 LJX LJZ LJZ LJZ LY4 LJX LY5 LJX LY4 LJZ LY4 LJZ LY5 LJX
 30 593 887 892 033 960 026 021 995 994 947 910 998 010 001 056 972 968 008 966 947 018 899 016 051 922 511
      LUM LYS LUX LY4 LUM LY4 LUM LY4 LUM LY4 LUM LUZ LUM LUZ LUM LY4 LUM LY
 28 489 924 893 939 551 946 462 994 468 997 495 943 516 499 996 555 999 463 988 458 941 566 878 993 964 193
      LUM LY4 LUX LY5 LUM LY4 LUM LY5 LUM LY5 LUM LUZ LUM LUM LUZ LUM LY4 LUM LY4 LUM LY5 LUM LY4 LUX LY5 LUM
 26 603 968 933 017 485 988 453 030 474 011 502 033 548 508 030 600 931 464 880 466 038 481 902 908 052 519
      LJM LJX LYS LJZ LY4 LJZ LY5 LJX LY4 LJX LY4 LJZ LJZ LJZ LJZ LY4 LJX LY4 LJX LY5 LJZ LY4 LJZ LY4 LJX LJM
 24 571 875 020 021 985 035 044 929 971 874 956 031 046 008 017 918 940 903 901 045 002 926 051 931 962 505
      LJM LJX LJM LY5 LJM LY4-LJM LY4-LJM LY4-LJM LY4-LJM LJM LJ4-LJM LY4-LJM LY4-LJM LJX-LJM
 22 483 975 532 004 567 976 541 962 491 953 549 958 594 589 938 517 891 490 943 527 991 498 896 479 912 482
      LJM LJX LY5 LJX LY5 LJZ LY4 LJX LJX LJM LY4 LJX LY5 LY4 LJX LY4 LJM LJX LJZ LY4 LJZ LY4 LJZ LY4 LJZ LY4 LJX LJM
 20 500 963 047 999 042 037 954 997 959 606 921 942 026 924 909 885 486 900 044 912 036 887 005 895 898 596
      LJM LJX LJX LYS LJM LY4 LJM LY4 LJM LJX LJM LY5 LJM LY4 LJM LJX LJM LY5 LJM LY5 LJM LY4 LJX LJX LJM
  18 496 873 936 009 477 966 560 961 455 918 480 031 473 465 890 597 973 460 029 488 019 487 982 994 976 529
            LJM LJX LJX LY4 LJZ LY5 LJX LY4 LJZ LY5 LJX LY4 LJX LY4 LJX LY4 LJX LY4 LJZ LY4 LJX LJX LJX-LJM
            603 965 932 877 004 014 871 939 015 023 958 881 869 952 929 024 866 884 927 009 872 902 987 586
                  LJX LY4 LJX LY4 LJM LY4 LJM LY4 LJM LY5 LJM LJN LY5 LJM LY4 LJM LY5 LJM LY5 LJX LY4 LJX
                  972 959 964 952 472 965 478 975 544 053 454 461 025 512 995 534 028 457 050 986 875 904
  14
                  LJM LJX LY5 LJX LY4 LJZ LY4 LJX LY4 LJX LY4 LJX LJM
                                              011 979 022 879 048 871 911 054 917 025 928 014 868 894 922 982 515
  12
                                   969 936
                  LJB LJX LJM LY4 LJX LY5 LJM LY4 LJM LY4 LJM LJM LY5 LJM LY4 LJM LY5 LJX LY5 LJM LJX LJB
                  296 934 583 967 870 034 587 986 531 950 576 553 056 595 858 530 048 951 055 518 890 375
                        LJB LJX LJX LY4 LJX LY4 LJZ LY5 LJZ LY4 LJZ LY4 LJZ LY4 LJX LY4 LJX LJX LJX LJB
                        300 868 971 874 992 873 039 027 019 973 923 023 919 027 925 907 920 891 896 346
                             LJB LJM LJX LJX LJX LY5 LJM LY5 LJX LJX LY4 LJM LY5 LJX LJX LJX LJM LJB
                                                                     006 935 941 898 536 046 889 944 938 523 345
                             360 574 872 883 970
                                                          932
                                                                509
                                               LJM LJX LJX LJX LJX LY5 LY4 LJX LJX LJX LJX LJX
                                               610 985 878 984 927 615 916 869 945 925 943 575
                                                    LJM LJM LJM LJM LJM LJM LJM LJM LJM
                                                     605 664 561 584 513 520 521 507 568 588
  02
                                     11 13 15 17 19 21 23 25 27 29 31
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