UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30323

Report Nos.: 50-259/91-27, 50-260/91-27, and 50-296/91-27

Licensee: Tennessee Valley Authority
6N 38A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Docket Nos.: 50-259, 50-260, and 50-296

License Nos.: DPR-33, DPR-52, and DPR-68

Facility Name: Browns Ferry Units 1, 2, and 3

Inspection Conducted: July 29 - August 2, 1991

Inspector: _____ 28 August 1991
P. T. Burnett Date Signed

Approved by: _____ 8/28/91
R. V. Crlenjak, Chief Date Signed
Operational Programs Section
Operations Branch
Division of Reactor Safety

SUMMARY

Scope:

This routine unannounced inspection addressed the areas of surveillance of core power distribution limits, calibration of nuclear instrumentation systems, core thermal power evaluation, and post-refueling startup tests.

Results:

All tests and surveillances reviewed by the inspector were satisfactory with respect to both frequency and results..

Performance of the on-shift reactor engineer in the control during transient test was exemplary (paragraph 5).

No violations or deviations were identified.

REPORT DETAILS

1. Persons Contacted

Licensee Employees:

*M. Bajestani, Technical Support Manager
*J. Daniel, Licensing
*D. Gruber, Maintenance
M. Herrell, Operations Manager
J. Lewis, Reactor Engineering Supervisor
*J. Maddox, Engineering
*R. Miller, Quality Assurance Evaluator
L. Myers, Plant Manager
*J. Ownby, Engineering
G. Pierce, Site Licensing
*E. Ridgell, Compliance Licensing
*P. Salas, Compliance Supervisor
*J. Swindell, Unit 3 Plant

Other licensee employees or contractors contacted included licensed reactor operators, shift technical advisors, and engineering personnel.

NRC Personnel Onsite:

W. Bearden, Resident Inspector
E. Christnot, Resident Inspector
K. Ivey, Resident Inspector
*P. Kellogg, Section Chief, Browns Ferry
C. Patterson, Senior Resident Inspector

*Attended exit interview on August 2, 1991.

Acronyms and initialisms used throughout this report are defined in the final paragraph.

2. Surveillance of Core Power Distribution Limits (61702)

2-SI-2.1 (Revision 4), Core Performance Data, implements the daily, with power => 25 percent RTP, surveillance of thermal limits required by TS 4.5.I,J,K, and L. Completed copies of the procedure were reviewed for the period July 4 to 24, 1991, inclusive. All thermal limits were satisfactory and within the expected range. Initially, there appeared to be a large number of failed LPRMs and, concomitantly, a large number of Base Crit Codes. Licensee personnel stated that vendor personnel recovered many of the LPRMs by applying high voltage shocks to them. The changes in power level, flow biased scram setpoint, failed LPRMs, and Base Crit Codes during this period

are shown in Figure 1. Inspection in this subject area will be continued in subsequent inspections, when more completed surveillance procedures are available for review.

No violations or deviations were identified.

3. Calibration of Nuclear Instrumentation Systems (61705)

2-SI-4.1.B.3 (Revision 4), Reactor Protection System LPRM Calibration, implements the surveillance requirements of TS Table 4.1.B (item 3). It was first performed, for this operating cycle, on July 8 - 10, 1991, at about 48 percent RTP, which was about 3 EFPD into the cycle.

2-TI-136 (Revision 4), APRM Calibration, was performed during low power operation, when power determination by heat balance is not possible. Power determinations on June 3 and 12, 1991, used the measured RCS heatup rate to determine power. In both cases, power was less than 1 percent RTP. At slightly higher powers, with at least one turbine bypass valve open, power was determined by bypass valve position. Analyses in the period June 15 to 27, 1991, yielded powers ranging from 1.4 percent RTP to 7.3 percent RTP. The records confirm that core power was adequately monitored and the APRMs adequately calibrated during the low power operation reviewed.

Inspection in this subject area will be continued in subsequent inspections, when more completed surveillance procedures are available for review.

No violations or deviations were identified.

4. Core Thermal Power Evaluation (61706)

0-TI-61 (Revision 5), Core Manual Heat Balance, is performed monthly to check the calculations made by the plant computer or when the computer is unavailable. This procedure was performed 14 times for Unit 2 during the period from June 27, 1991 to July 5, 1991, at power levels ranging from 10 to 35 percent RTP. The results for the higher power levels of this range were in acceptable agreement with the CTPs reported by the P1 calculation at same time.

The calculation includes a density correction for feedwater temperature differing from the nominal value. The inspector questioned the application of this correction; since it would appear that, if such a correction is to be made, it should be as the ratio of the square roots of the densities rather than the ratio of the densities. The licensee is reviewing the bases for the calculation. Inspection in this subject area will be continued in subsequent inspections.

No violations or deviations were identified.

5. Post-Refueling Startup Tests (72700)

The completed procedures discussed below were reviewed by the inspector.

2-SI-4.3.B.3.a (Revision 4), RWM and RSCS Functional Test for Startup, was performed to confirm conformance to TS 4.3.B.3.a.1 and TS 4.3.B.3.b.1. Review of procedures completed in May and June 1991, confirmed that the procedure had been performed numerous times to complete RWM system checks, RSCS comparator checks, sequence control logic checks, and to demonstrate RWM operability following a process computer renormalization or outage. Finally, on June 21 and June 25, 1991, the group notch logic of the RSCS was functionally tested. Other plant records confirmed that the latter tests were performed promptly after reaching a black and white rod pattern. Discussions with reactor engineering personnel confirmed that no rod notching problems had been encountered to interfere with the logic of the RSCS.

2-SI-4.3.B.3.b (Revision 2), RWM and RSCS Functional Test for Shutdown, was performed on July 8, 1991, to confirm conformance to TS 4.3.B.3.a.2 and TS 4.3.B.3.b.2.

2-SI-4.3.B.3.b.3 (Revision 1), RWM Program Verification, was performed to confirm conformance to TS 3.3.B.3.b and TS 4.3.B.3.b.3, which require a second licensed operator or other qualified person to confirm compliance with the control rod pattern when the RWM is inoperable. The procedure was last performed on May 24, 1991.

Part of procedure 2-TI-189, to confirm proper operation of the HPCI, was witnessed in the control room, on August 2, 1991. The test was initiated from about 78 percent RTP with core flow near 100 percent. HPCI produced a nominal 5000 gpm. Plant response was as anticipated: neutron power, as monitored by the APRMs, increased 7-9 percent; vessel water level increased and stabilized; system pressure remained essentially constant; and generator power increased about 2 percent. Prior to, during, and after the test, the reactor engineer in the control room constantly monitored core thermal limits and other core performance parameters. He made accurate predictions of reactor response to the transient and anticipated the data and analysis requirements of the shift supervisor and the test personnel.

2-SI-4.6.A.1 (Revision 1), Reactor Heatup or Cooldown Rate Monitoring, was performed to implement the requirements of TS 4.6.A.1 and insure that the reactor vessel temperature did not change in excess of 100 Degrees F in one hour. Throughout May

and June of 1991, the procedure was performed as needed to monitor changes in vessel temperature. Review of the completed procedures confirmed that all temperature changes were within limits.

No violations or deviations were identified.

6. Exit Interview

The inspection scope and findings were summarized on August 2, 1991, with those persons indicated in paragraph 1 above. The inspector described the areas inspected and discussed in detail the inspection findings. No dissenting comments were received from the licensee. Proprietary material was reviewed in the course of this inspection, but is not included within this report.

7. Acronyms and Initialisms Used throughout This Report

APRM	Average power range monitor
BOC	Beginning of cycle
CPR	Critical power ratio
CTP	Core thermal power
EFPD	Effective full power day(s)
gpm	Gallons per minute
HPCI	High pressure coolant injection (system)
LPRM	Local power range monitor
MAPLHGR	Maximum average planar linear heat generate rate
P1	Periodic core evaluation program on the process computer
RCS	Reactor coolant system
RSCS	Rod sequence control system
RTP	Rated thermal power
RWM	Rod worth minimizer
SI	Surveillance instruction
TI	Technical instruction
TS	Technical Specification

Attachment: Figure 1 - Browns Ferry 2, Cycle 6, Early Trends

Figure 1 – Early Trends

BROWNS FERRY 2, CYCLE 6