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

Report Nos.: 50-259/85-25, 50-260/85-25, and 50-296/85-25

Licensee: Tennessee Valley Authority
500A Chestnut Street
Chattanooga, TN 37401

Docket Nos.: 50-259, 50-260 and 50-296 License Nos.: DPR-33, DPR-52, and DPR-68

Facility Name: Browns Ferry Nuclear Plant

Inspection Conducted: March 26 - April 25, 1985

Inspectors: W. H. Ruland for — 5/21/85
G. L. Paulk — Date Signed

W. H. Ruland for — 5/21/85
C. A. Patterson — Date Signed

W. H. Ruland for — 5/21/85
C. R. Brooks — Date Signed

Approved by: [signature] — 5/21/85
F. S. Cantrell, Section Chief — Date Signed
Division of Reactor Projects

SUMMARY

Scope: This routine, unannounced inspection entailed 290 inspector-hours in the areas of operational safety, maintenance observation, surveillance, reportable occurrences and reactor trips.

Results: One violation with four examples of technical specification 6.3.A for failure to follow procedures related to battery surveillance and clearance procedures.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

J. A. Coffey, Site Director
G. T. Jones, Plant Manager
J. E. Swindell, Superintendent - Operations/Engineering
J. R. Pittman, Superintendent - Maintenance
J. H. Rinne, Modifications Manager
J. D. Carlson, Quality Engineering Supervisor
D. C. Mims, Engineering Group Supervisor
Ray Hunkapillar, Operations Group Supervisor
C. G. Wages, Mechanical Maintenance Supervisor
T. D. Cosby, Electrical Maintenance Supervisor
R. E. Burns, Instrument Maintnenace Supervisor
A. W. Sorrell, Health Physics Supervisor
R. E. Jackson, Chief Public Safety
T. L. Chinn, Senior Shift Manager
T. F. Ziegler, Site Services Manager
J. R. Clark, Chemical Unit Supervisor
B. C. Morris, Plant Compliance Supervisor
A. L. Burnette, Assistant Operations Group Supervisor
R. R. Smallwood, Assistant Operations Group Supervisor
T. W. Jordan, Assistant Operations Group Supervisor
S. R. Maehr, Planning/Scheduling Supervisor
G. R. Hall, Design Services Manager
W. C. Thomison, Engineering Section Supervisor
A. L. Clement, Radwaste Group Controller
R. L. Lewis, Senior Shift Manager

Other licensee employees contacted included licensed reactor operators, auxiliary operators, craftsmen, technicians, public safety officers, Quality Assurance; Design and engineering personnel.

2. Exit Interview

The inspection scope and findings were summarized on April 26 and 29, 1985, with the Plant Manager and/or Assistant Plant Managers and other members of his staff.

The licensee acknowledged the findings and took no exceptions. The licensee did not identify as proprietary any of the materials provided to or reviewed by the inspectors during this inspection.

3. Licensee Action on Previous Enforcement Matters (92702)

This subject was not addressed in the inspection.

4. Unresolved Items*

There were three new unresolved items as identified in paragraphs 5, 7, and 9.

5. Operation Safety (71707, 71710)

The inspectors were kept informed on a daily basis of the overall plant status and any significant safety matters related to plant operations. Daily discussions were held each morning with plant management and various members of the plant operating staff.

The inspectors made frequent visits to the control rooms such that each was visited at least daily when an inspector was on site. Observations included instrument readings, setpoints and recordings; status of operating systems; status and alignments of emergency standby systems; onsite and offsite emergency power sources available for automatic operation; purposes of temporary tags on equipment controls and switches; annunciator alarm status; adherence to procedures; adherence to limiting conditions for operations; nuclear instruments operable; temporary alterations in effect; daily journals and logs; stack monitor recorder traces; and control room manning. This inspection activity also included numerous informal discussions with operators and their supervisors.

General plant tours were conducted on at least a weekly basis. Portions of the turbine building, each reactor building and outside areas were visited. Observations included valve positions and system alignment; snubber and hanger conditions; containment isolation alignments; instrument readings; housekeeping; proper power supply and breaker alignments; radiation area controls; tag controls on equipment; work activities in progress; radiation protection controls adequate; vital area controls; personnel search and escort; and vehicle search and escort. Informal discussions were held with selected plant personnel in their functional areas during these tours. Weekly verifications of system status which included major flow path valve alignment, instrument alignment, and switch position alignments were performed on the high pressure coolant injection systems.

A complete walkdown of the accessible portions of the D.C. battery supply system was conducted to verify system operability. Typical of the items checked during the walkdown were: lineup procedures match plant drawings and the as-built configuration, hangers and supports operable, housekeeping adequate, electrical panel interior conditions, calibration dates appropriate, system instrumentation on-line, valve position alignment correct, valves locked as appropriate and system indicators functioning properly.

*An Unresolved Item is a matter about which more information is required to determine whether it is acceptable or may involve a violation or deviation.

During a routine tour of the Unit 3 Reactor Building, the inspector noted several discrepancies associated with the control rod drive hydraulic control units (HCU). Directional control valves on twelve HCUs were found to be missing the valve cap which encases the needle valve used for rod timing adjustment. One directional control valve was found to be missing its solenoid enclosure cover thus exposing the coil and terminals to the environment. Channel nuts which are used to fasten the HCU frame to the channel embedded in the concrete pad were found to be rotated 90-degrees such that they performed no useful function on several HCUs. Channel nuts on all HCUs showed signs of excessive deterioration from rust. Still other HCUs were found with visibly loose mounting hardware (several threads visible on the bolt beneath the bolt head). Although the majority of the HCUs are mounted back-to-back, several HCUs on the end of a string are free-standing with no additional restraints to substitute for the support otherwise provided by the mating HCU frame. The inspector informed the licensee of these problems. The inspector found similar problems with the Unit 1 HCUs. Also, large flat washers were used with the Unit 3 HCU frame bolts but smaller lockwashers were used on the Unit 1 frame bolts. These concerns are identified as an unresolved item pending further analysis by the licensee (259/260/296/85-25-01).

The licensee reported on March 28, 1985, that a design error was discovered in the electrical circuit for two handswitches (63-24 and 63-25) which allow bypassing the interlock for drywell purging in the RUN mode of operation. With these switches in the bypass positions and the mode switch in RUN, the standby gas treatment system, the control room emergency pressurization system and some group six isolations would be inoperable. This item will be inspected further and will be carried as an inspector followup item (IFI 259/85-25-02).

6. Maintenance Observation (62703)

Plant maintenance activities of selected safety-related systems and components were observed/reviewed to ascertain that they were conducted in accordance with requirements. The following items were considered during this review: the limiting conditions for operations were met; activities were accomplished using approved procedures; functional testing and/or calibrations were performed prior to returning components or system to service; quality control records were maintained; activities were accomplished by qualified personnel; parts and materials used were properly certified; proper tagout clearance procedures were adhered to; Technical Specification adherence; and radiological controls were implemented as required.

Maintenance requests were reviewed to determine status of outstanding jobs and to assure that priority was assigned to safety-related equipment maintenance which might affect plant safety. The inspectors observed the below listed maintenance activities during this report period:

a. Battery corrective maintenance for main and diesel batteries
b. Limitorque valve pinion gear inspection

c. Unit 2 refueling operations
d. "C" fire pump maintenance
e. LPCI MG set maintenance - Unit 2

During a routine tour of the reactor building on April 23, 1985, the inspectors noted that the 2DA low pressure coolant injection (LPCI) motor-generator set was tagged out for maintenance and the motor removed. However, several alarm lights were illuminated at the local control station. At junction box 5991, a white light for TRIP HI-HI MOTOR TEMP and at junction box 5952 a white light for WARNING MOTOR TEMP HI and a red light for TRIP MOTOR TEMP HI-HI were illuminated. The local switches at the junction boxes for the LPCI motor-generator were tagged under hold order 85-150A. The shift engineer and electrical maintenance supervisor were notified of the inspector's concern that voltage still might be applied to some of the lifted motor leads on April 23, 1985.

On April 29, 1985, the inspector was notified by the electrical maintenance section that the thermistor leads were lifted when the motor was removed. These leads were not included in the hold order and upon followup inspection were found to be "hot" (18 volts). The tagout was to be revised to include an additional boundary to secure power to the thermistor leads.

Plant Standard Practice BF 14.25, Clearance Procedure, requires all sources of electrical power be removed from equipment for work to be safely performed. This item is included as the fourth example of the violation for failure to follow procedure (260/85-25-03).

Further review of hold order 85-150A indicated that the hold order tag (#3) placed on the main supply circuit breaker to the 2DA LPCI MG set was an incorrect tag. The 2EN LPCI motor-generator set that was tagged out on hold order 85-118 also had an incorrect tag placed on its main supply circuit breaker. The tag for the 2DA LPCI MG set had been inadvertently placed on the main breaker for the 2EN LPCI MG set and vice versa. This violation of clearance procedures is included in the fourth example noted above.

7. Surveillance Testing Observation (61726)

The inspectors observed and/or reviewed the below listed surveillance procedures. The inspection consisted of a review of the procedures for technical adequacy, conformance to technical specifications, verification of test instrument calibration, observation on the conduct of the test, removal from service and return to service of the system, a review of test data, limiting condition for operation met, testing accomplished by qualified personnel, and that the surveillance was completed at the required frequency.

- S.I. 4.5.E.1.c HPCI MOV Operability Test
- S.I. 3.2 Inservice Section XI Valve Testing
- S.I. 4.9.A.2.b Auxiliary Electrical Equipment - Battery Analysis
- S.I. 4.9.A.2.a Auxiliary Electrical Equipment - Battery Check

The inspectors reviewed surveillances established to satisfy Technical Specification Surveillance Requirement 4.9.A.2, Unit Batteries (250-volt). This closes inspector followup item (259/260/296/DRP 85-01), Station Battery Operation, Maintenance and Inspection.

During the station battery inspection phase, the inspectors identified several discrepancies related to the seismic qualification of the batteries and their racks. These shall be tracked as an unresolved item (259/260/296/85-25-04) and are as follows:

a. The Unit 250-volt battery racks are not fastened to the floor-mounted pedestals as depicted in the as-constructed drawings. Although TVA drawing 48N949RA shows the Unit 3 Main Battery rack bolted to the pedestal with 5/8-inch bolts, the rack is actually welded to the pedestal. TVA drawing 48N958RA shows the Units 1 and 2 Main Battery racks welded to the pedestal; however, the racks are actually welded and bolted to the pedestal. The licensee has initiated a safety evaluation and discrepancy reports on the drawings.

b. None of the Diesel Generator Battery racks are fastened to the embedded plates as depicted in the as-constructed drawings. TVA drawing 48N897-5RC shows field supplied shims or finish concrete should be installed for level rack installation. The racks were found to be elevated about 2-inches above the embedded plate with no shims or concrete. The licensee performed an analysis which indicated that the racks were not seismically qualified in their present condition and initiated the installation of shims per the as-constructed drawing.

c. Many battery rack fasteners were not installed per the vendor manual (C&D Installation and Operating Instructions for Stationary Batteries, Section 12-600-1). Channel nuts are used to fasten the rail to the frame as depicted in Figure 3 of the vendor manual. The nuts were found rotated 90-degrees such that they performed no fastening function on several locations of the Shutdown Board B, C and D Battery racks and the Main Unit 1 and 3 Battery racks. Several loose tie rods were additionally found on Unit 1 and 3 Main battery racks.

d. Although Section 3.2.3 of the Vendor Manual requires "furnished plastic spacers" be placed between each cell, plywood spacers were found on the Main Unit 1, 2 and 3 batteries and either styrofoam or foam rubber spacers were found in the remaining locations.

e. The end cells on the 3EB Shutdown Board battery were found about 3-inches away from the battery rack end rail. The licensee has initiated action to move the end rail such that it butts against the end cells.

A detailed review of Surveillance Instruction (SI) 4.9.A.2.b, Auxiliary Electrical Equipment - Battery Analysis, and SI 4.9.A.2.a, Auxiliary Electrical Equipment - Battery Check, found other items in conflict with the Vendor Manual. These items will be tracked as an Inspector Followup Item (IFI 259/85-25-05) and are as follows:

a. SI 4.9.A.2.b Step 3.7 requires that individual cell voltages be within ±0.1 volt of the average battery cell voltage. Section 7.2 of the Vendor Manual, however, indicates that cell voltages should be within ±0.04 volt and provides a list of potential problems which may cause cell voltages outside this range. The licensee has indicated that they have historically had difficulty meeting a .04 volt acceptance criteria and initial contact with the vendor resulted in concurrence with an 0.1 volt criteria.

b. SI 4.9.A.2.a contains an acceptance criteria of 267 ±3.0 volts for Shutdown Board battery overall float voltage. Since Shutdown Board B Battery currently has three cells jumped out due to a broken intercell terminal post, the float voltage per cell is 2.28 ± .025 volts. This is outside the Vendor Manual requirements of 2.20 to 2.25 volts per cell for float voltage. The licensee is evaluating the effect of maintaining excessive float voltage on the battery.

c. The battery cell temperature recorded for the Shutdown Board 3EB battery during the performance of SI 4.9.A.2.a on February 5, 1985, was 45° F. According to the Vendor Manual (Section 7.3), battery capacity decreases to about 81% of rated capacity at this temperature. Since the acceptance criteria for the battery capacity test required by T.S. 4.9.A.2.c is 80%, temperatures less than 45° F. have the potential for making the battery inoperable. The licensee is evaluating this event.

A review of recently completed Surveillance Instruction Data Sheets was performed. Three examples of failure to follow procedures were identified:

a. SI 4.9.A.2.a, Auxiliary Electrical Equipment Battery Check, is intended to satisfy the weekly pilot cell checks required by Technical Specification 4.9.A.2.a. Battery pilot cells are rotated every four months and are designated in Electrical Maintenance Instruction No. 4 (EMI-4), Batteries. SI 4.9.A.2.a performed on February 25 through 27, 1985, checked cell no. 60 for the Unit batteries and cell no. 30 for the Diesel batteries rather than the pilot cells specified in EMI-4 (cell no. 68 for the Unit batteries and cell no. 38 for the Diesel batteries). Thus, the weekly pilot cell checks required by T.S. 4.9.A.2.a were not completed during the week of February 24, 1985.

b. SI 4.9.A.2.a is also intended to satisfy the weekly check of overall battery voltage required by T.S. 4.9.A.2.a. The acceptance criteria specified in SI 4.9.A.2.a is 133.5 ± 1.5 volts for Diesel Generator Battery overall battery voltage. SI 4.0.A.2.a, performed on

February 11 - 12, 1985, has 130.4 volts recorded for Diesel Generator A overall voltage. This is outside the acceptance criteria; however, the surveillance data sheet indicates that overall float voltage acceptance criteria was satisfied and no corrective action was initiated.

c. Surveillance Instruction 4.9.A.2.b, Auxiliary Electrical Equipment Battery Analysis, provides a check that individual cell voltages are within ± 0.1 volts of the average cell voltage. SI 4.9.A.2.b, performed on February 20, 1985, contains an error that essentially negated the check which was performed. The SI 4.9.A.2.b data sheet originally recorded 262.4 volts as the overall battery voltage and 2.186 volts as the average cell voltage (262.4 volts divided by 120 cells). Individual cell voltages were then compared with this value. Subsequent to this comparison, the overall battery voltage was revised to 268.4 volts (a single line was drawn through the original value with initials of the individual who made the revision); however, the change was not carried through to the calculation of average cell voltage which should have been revised to 2.237 volts. The verification that individual cell voltages were within 0.1 volt of average cell voltage was not repeated using the revised figures.

The above violation (259/260/296/85-25-06) of Technical Specification 6.3.A., Failure to Adhere to Procedures, was discussed with the licensee during an exit interview on April 26, 1985.

During a review of Surveillance Instruction (SI) 4.5.E.1.c., High Pressure Coolant Injection (HPCI) System Motor Operated Valves Operability Test, an unexplained difference between units in the maximum allowed valve stroke timing was found. The following times in seconds were given in the instruction for the two series HPCI torus suction valves 73-26 and 73-27:

Valve	Time (sec.)
1-73-26	73.5
1-73-27	78
2-73-26	87
2-73-27	81
3-73-26	86.3
3-73-27	44.3

The value given for Unit 3 73-27 was about half the value of the other valves. The inspector questioned the reason for the difference and if the direct current motor operated valve 73-27 could have an open shunt motor field causing the valve to operate at a faster speed. Data reviewed for the past several years indicated the difference has existed over a period of years. The licensee is evaluating the timing difference. This will remain an unresolved item pending resolution of the time difference by the licensee (296/85-25-07).

8. Reportable Occurrences (90712, 92700)

The below listed licensee event reports (LERs) were reviewed to determine if the information provided met NRC requirements. The determination included adequacy of event description, verification of compliance with technical specifications and regulatory requirements, corrective action taken, existence of potential generic problems, reporting requirements satisfied, and the relative safety significance of each event. Additional in-plant reviews and discussion with plant personnel, as appropriate, were conducted for those reports indicated by an asterisk. The following licensee event reports are closed:

LER No.	Date	Event
259/84-38	12-19-84	RCIC Ramp Generator failure
*259/85-01	01-21-85	Leakage in drywell due to core spray test hoses being left on after surveillance.
*259/85-02	01-24-85	Inadvertent start of all diesels and core spray pumps during surveillance
*259/85-03	02-05-85	Inadvertent start of diesel generators "C" and "D" during functional testing of protective relays. Trip of 161kv offsite lines occurred during this event.

No violations or deviations were identified.

9. Reactor Trip (93702)

The inspectors reviewed activities associated with the below listed reactor trips during this report period. This review included determination of cause, safety significance, performance of personnel and systems, and corrective action. The inspectors examined instrument recordings, computer printouts, operations journal entries, scram reports and had discussions with operations, maintenance and engineering support personnel as appropriate.

Unit 1 was manually scrammed from 30.9% power as part of a controlled shutdown on August 21, 1984. The shutdown was forced by a 7-day LCO entered on August 14, 1984 per T.S. 3.5.A.2 following an inadvertent overpressurization of core spray system loop 1. Failure of a Rod Worth Minimizer

System (RWM) surveillance during the controlled shutdown forced the insertion of the manual scram at 30.9% power to complete the shutdown. There were no safety system challenges during the shutdown.

On January 16, 1985, a low reactor water level scram occurred from 99% power on Unit 1 due to a failed level controller (LIC 46-5). As water level continued to decrease, the recirculation pumps tripped, main steam isolation valves closed, high pressure coolant injection (HPCI) and reactor core isolation cooling (RCIC) systems initiated automatically as designed; however, several problems developed. HPCI recovered reactor water level, but RCIC did not inject since it immediately tripped on overspeed and high exhaust pressure. Reactor pressure was manually controlled by opening Main Steam relief valves (MSRV). False position indication developed in the MSRV acoustic monitoring system which led the operators to believe that a relief valve was sticking open. All safety systems performed as designed except as noted.

On March 19, 1985, Unit 1 was scrammed from 44% power as part of a controlled shutdown required by Technical Specification 4.7.A.2.b. Two primary containment isolation valves (HCV 71-14 and HCV 73-23) had failed local leak rate tests placing the Unit in an LCO.

Unit 3 was scrammed from 47% power as part of a controlled shutdown to investigate the source of excessive unidentified drywell leakage on February 9, 1983. The unit was shutdown by manual scram rather than controlled rod insertions since two IRMs (B&F) were inoperable. The leak was identified on a 3/4-inch test connection near the inboard reactor water cleanup (RWCU) isolation valve and was determined to be a vibration induced fatigue crack. There were no safety system challenges during the trip.

Unit 3 was scrammed from less than 3% power on March 9, 1985, as part of a controlled shutdown to investigate reactor water level discrepancies observed during the previous startup. There were no safety system challenges during the trip. The scram was forced by Rod Worth Minimizer (RWM) problems which were eventually traced to omissions in the RWM program.

On June 16, 1984, the Unit 2 reactor scrammed from 60.9% power due to a false main turbine oil tank low level signal which initiated a turbine stop valve closure. The cause of the oil tank low level signal could not be determined but was believed to be due to an operator who inadvertently bumped the switch while performing a weekly check of the level gauge. No other safety systems were challenged during the event.

Various recurring administrative errors were noted in the licensee's post trip review packages for these events. These items were discussed with the licensee during an exit meeting on April 26, 1985. Examples are as follows:

Trip Report	Problem
U-1, Trip 176	(1) STA completed Preliminary Scram Evaluation at 0840 on August 21, 1984. Trip did not occur until 1440 on August 21, 1984.

	(2)	No UO, ASE, or SE signatures on GOI-100-11 cover sheet.
U-1, Trip 177	(1)	Preliminary Scram Evaluation at 1445 on January 17, 1985. This is 24 hours after trip (1440 on January 16, 1985). SP 12.8 requires 8 hours.
	(2)	Independent technical review was not independent (it was performed by same man who did the Preliminary Scram Evaluation) and it was not completed within 32 hours as required by SP 12.8 (trip at 1440 on January 16, 1985, independent review at January 22, 1985).
U-1, Trip 178	(1)	STA did not sign Preliminary Scram Report cover page.
	(2)	Control rod density listed as N/A on Preliminary Report with no explanation.
	(3)	Shift Engineer reviewed Preliminary Scram Report before STA completed this report (SE review at 0155 March 19, 1985, STA completed at 0621, March 19, 1985).
U-3, Trip 116	(1)	Independent technical review did not meet 32 hour criteria (Trip at 2315 February 9, 1985, review at 1200 February 12, 1985).
U-2, Trip 152	(2)	Shift Engineer decided not to inform Engineering Section Supervisor to place the trip on Immediate Attention List (IAL) for tracking because there is no I.A.L. on the weekend and they were going to restart immediately. Procedure requires placing on I.A.L.

During a routine review on April 24, 1985, of scram report number 117 for the Unit 3 shutdown conducted March 9, 1985, the inspector noted that a part of the Rod Worth Minimizer (RWM) computer program was found to be missing. During the controlled shutdown the RWM became inoperable. When RWM group five was completely inserted, the RWM latched to group one rather than group four. Attempts at reinitializing the process computer and RWM to correct the problem were unsuccessful. The unit was manually scrammed.

During troubleshooting of the RWM program the alarm message table portion of the program was found to be missing. The RWM program can be aborted for a variety of reasons. When an abort occurs, a message appears on the alarm typer giving the reason for the abort. All of the messages which should have been in the message table were missing. Below is a list of the messages:

RWM - RPIS FAILED
RWM - ROD SELECTED AND DRIVING, ROD NOT SELECTED

RWM - INVALID ROD IDENTIFICATION
RWM - RWM OPERABLE INPUT LOGIC 0
RWM - LOAD SEQUENCES BEFORE STARTING
RWM - CONTROL ROD SCRAM FAILED
RWM - FAILED APPLYING (withdraw or insert) (block or permissive)
RWM - LPSP LOGIC 0 AND LPAP LOGIC I
RWM - MORE THAN THREE INSERT ERRORS
RWM - MORE THAN ONE WITHDRAW ERROR
RWM - M.O.D. FAILED
RWM - SEGMENT TRANSFER FAILURE

It was thought that when the computer went to execute this portion of the program a message was sent to the alarm typer which was not understandable. Each output device has a default device and after attempting to output to all of the available output devices the computer locked up.

Discussions with plant computer personnel revealed that erratic operation of Unit 3 process computer has occurred for the past several years. The missing section of the program was discovered during troubleshooting for a perceived hardware problem believed to be causing erratic operation of the computer. After loading the section of missing program into the write-protected area of the computer memory, smooth operation of the RWM program was observed. The alarm message table was found to be in place in the Unit I and II process computer memory.

This problem occurred due to a lack of control in the past for the process computer. The plant computer personnel have initiated procedures to make a record of the write-protected area of computer memory on magnetic tape each month. The previous month's tape would be used to verify no changes had occurred in the protected area of memory.

The RWM program problems will remain unresolved pending resolution that the RWM program is functioning properly and review of computer software maintenance procedures. This item was discussed in an exit meeting with plant management on April 26, 1985 (259/85-25-08).