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

Report Nos.: 50-259/85-09, 50-260/85-09, and 50-296/85-09

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 1, 2, and 3

Inspection Conducted: January 26 - February 25, 1985

Inspectors: G. L. Paulk — 3/22/85 Date Signed

C. A. Patterson — 3/22/85 Date Signed

Approved by: F. S. Cantrell, Section Chief, Division of Reactor Projects — 3/22/85 Date Signed

SUMMARY

Scope: This routine, unannounced inspection entailed 150 inspector-hours in the areas of operational safety, maintenance observation, reportable occurrences surveillance, Unit 3 bottom drain temperature problems, in-office review, and the Regulatory Improvement Program.

Results: There was one violation of Technical Specification 6.3.A for inadequate procedures related to Radwaste building ventilation (O.I. 30) and Surveillance Instruction 4.2.F.18 for failure to specify adequate acceptance criteria related to the the consistency and nominally expected values for main steam relief valve thermocouple.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

J. A. Coffey, Site Director
C. T. Jones, Plant Manager
J. E. Swindell, Superintendent - Operations/Engineering
J. R. Pittmen, 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. C. Wages, Mechanical Maintenance Supervisor
T. D. Cosby, Electrical Maintenance Supervisor
R. E. Burns, Instrument Maintenance Supervisor
A. W. Sorrell, Health Physics Supervisor
R. E. Jackson, Chief Public Safety
T. L. Chinn, Technical Services 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
C. R. Hall, Design Services Manager
W. C. Thomison, Engineering Section Supervisor
A. L. Clement, Radwaste Group Controller

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

2. Exit Interview

The inspection scope and findings were summarized on February 22 and March 1, 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 area was not inspected for this report.

4. Operational 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 system; onsite and offsite emergency power sources available for automatic operation; purpose 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. The 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 badging, 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 residual heat removal 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, hangars 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.

A single loop test (ST 8501) on Unit 1 was conducted on February 9, 1985. The purpose of the test was to gather data for analysis at several different test plateaus under varying conditions of power, flow, dual and single recirculation pump operation and load line in order to define an operating region for stable single loop operation, and to gather baseline data for operation in that region. The data was collected and taken to Oak Ridge National Laboratory for detailed analysis. The final results of the test will depend on the analysis of the data, but no unstable operating conditions were observed during the test. This test was observed by Browns Ferry

Project Manager of Nuclear Reactor Regulation, Oak Ridge National Laboratory personnel, and the resident inspectors.

On January 15, 1985, the inspectors were informed by plant management that an abnormal increase in airborne radioactivity had occurred the previous day (January 14, 1985) in the protective clothing laundry room, EL 565' service building. A ventilation damper was reported to have vibrated closed causing the increase in airborne radioactivity. Management indicated that no problems existed from a health physics standpoint since all airborne surveys indicated less than the Maximum Permissible Concentration (MPC). The residents were informed that a report was being prepared by health physics personnel describing the circumstances. A copy of this report was obtained by the residents on February 5, 1985.

The report stated that the airborne radioactivity problem was first indicated by increasing background counts on friskers located in the service building laundry folding room (EL 565') and at the green tag control point (just outside the laundry room) used for normal exit frisking from the turbine building regulated area boundary. At 2:50 a.m., on January 14, 1985, background counts increased in the folding room from a normal of about 2,000 CPM to about 20, 000 CPM. Background counts returned to normal and increased again several times until at 7:10 a.m. background had increased such that the hand and foot monitors at the regulated area boundary were placed out of service and personnel were asked to leave the area and routed to different monitoring stations. Background counts in the laundry were reported to have reached a maximum of 45,000 to 105,000 DPM according to laundry personnel. Air samples taken during the incident resulted in no detectable activity on particulate air filters, 0.37 percent of MPC on charcoal filters and 128 percent of MPC (Xe-135) on a Marinelli gas sample. The background radiation levels were returned to normal after plant personnel discovered and corrected the problem (dampers in the radwaste building ventilation system which exhaust air from the laundry folding room were found to be closed instead of open). After reviewing the health physics report, the inspectors interviewed plant personnel to ascertain information which was not contained in the report. The concerns are summarized as follows:

a. The source of the airborne radioactivity has not been determined. It was speculated that radioactive gases were forced out of solution during batch transfer operations of liquid radwaste and that these gases then leaked from unknown locations. The gases then were directed into the laundry room by virtue of the closed dampers which isolated the normal removal path. Plant personnel informed the inspectors that studies are on-going by Muscle Shoals Health Physics personnel to identify radwaste leakage locations.

b. The inspectors questioned whether the affected area was properly controlled as an airborne radioactivity area as required by 10 CFR 20.203(d)(2) and Browns Ferry Radiological Controls Instruction (RCI-4). Personnel were apparently dispatched to gather the necessary posting signs and warning lights to properly post the area while guards

were stationed to prevent personnel entrance. The ventilation line-up was corrected, however, and background radiation levels returned to normal within 30 minutes and the area was never posted as an Airborne Radioactivity Area.

c. Although two similar events had occurred in the past (December 27, 1984 and January 6, 1985), no evidence could be found that controls had been established to prevent recurrence. This, despite a recommendation by the engineering group personnel who were charged with investigating the first occurrence. The engineering group recommended that administrative controls be established on the applicable ventilation dampers. It is not likely that these dampers vibrated closed since they are pinned in the open position.

The inspector considered the event report by Health Physics to be deficient in several areas. The report does not indicate that the area was considered an Airborne Radioactivity Area nor does it list the boundaries of the airborne problem (the report subject indicated that only a high background event occurred); it does not critique the handling of the event in that additional airborne surveys could have been taken both during and after the event. In fact, no gas sample was taken to verify the airborne concentration was restored to less than MPC; the report did not list what efforts were performed or planned to locate the source of the airborne radioactivity; it did not assess the radiological dose ramifications to expose personnel; and it does not identify management involvement during and after the event. These deficiencies were discussed with plant management during a routine daily meeting of February 8, 1985.

To determine the existing controls on the radwaste building ventilation dampers, the inspectors reviewed Operating Instruction (OI)-30, Ventilation System. The ventilation valve checklist contained in OI-30 lists the required position of the exhaust air filter train A & B inlet and outlet dampers (dampers 0-30-503, 504, 505, and 506) to be "Open to Preset Position". Although these steps had been signed off in the effective valve checklist, plant operators could not determine what the "Preset Position" was. These dampers were found closed on January 14, 1985, and caused the airborne radioactivity problem in the laundry folding room. This is violation of Technical Specification 6.3.A. (259/260/296/85-09-01) in that OI-30 does not specify the normal damper positions. Normally, one set of HEPA filters are isolated, whereas the procedure specifies all HEPA filters are on-line.

On January 30, 1985, the Residual Heat Removal (RHR) valve FCV 2-74-96, RHR cross connect for unit one RHR to unit two torus, was found inoperable, both electrically and manually. When operation was attempted electrically, the motor fuses blew. The valve could not be operated using the handwheel. The licensee conducted a failure evaluation and concluded that the electrical failure was due to corrosion in the local control station causing a ground.

The mechanical failure was a result of a loose capscrew which allowed the tripper adjustment arm to move, preventing the trippers from holding the actuator in the manual mode. The valve problems were corrected and the valve returned to service. The failure report stated that the failure was random in nature and no component or personnel problems existed. No recurrence control was required.

Also, on January 30, 1985, following a vibration check of 3D RHR pump, valve FCV-3-74-73 (loop two pump test return valve and torus cooling valve) failed to close. The valve (type SMB-2) could not be shut electrically or manually. The electrical failure was attributed to the motor endbell coming loose due to broken-thru bolts holding the endbell in place. Discussions with mechanical maintenance personnel revealed that the valve would operate manually and the initial failure was attributed to operations not knowing how to operate the valve hand-wheel. Investigation revealed that all four stator-thru-bolts had broken at the connection point to the base of the motor. Two of these bolts were missing and two were still in the motor stator housing. The motor stator was marked where the rotor had rubbed against it. On February 6, 1980, this motor was found with three loose and one broken stator housing thru-bolts.

The licensee found the valve vibration levels to be less than or equal to one inch per second. Vibration levels of less than or equal to one in/sec are not considered excessive for this valve. However, the vibration levels were sufficient to back out the bolts, which broke during valve operation.

The licensee's preliminary recommended action to prevent recurrence includes all or any of the following actions:

1. The 1/4" end bell bolts of standard low strength material are the problem area. The approximately 5/8" motor mounting bolts are not failing. The motor bolts are of grade five high-strength material. The bell bolts should be changed to grade five high-strength material.

2. The end bell bolt holes can be retapped to 3/8", and 3/8" bolts of grade five material can be used.

3. The bolts should be prevented from backing out. This can be done with a product such as Lock-Tight (Trade name) or with some type of star or lock washers. This step should be done regardless of what else is done. Preventing the bolts form backing out is the key to solving most of the problem.

4. Whatever is done to 3-FCV-74-73 should be done for all the valves on the three units (two valves per unit for a total of six valves. FCV-74-71 is the second valve).

The inspector will follow this item to determine final licensee corrective action. (259/85-09-02).

On February 5, 1985, at 12:33 p.m., while conducting a test of the unit two main generator output breaker, a partial loss of offsite power occurred. Unit two was in a refueling outage and units one and three remained at 100% power during the electrical transient. The two sources of offsite power connected to the site are two 161 Kv lines forming one source and seven 500Kv lines as the other sources. When a test breaker was connected to the unit two generator output circuitry, a loss of both 161 Kv lines and two of the seven 500 Kv lines occurred. Two of the four shared unit one and two diesel generators 'C' and 'D' started on an undervoltage condition of the respective shutdown boards. At 12:45 p.m., an unusual event was declared for a loss of offsite power. This was later cancelled at 1:20 p.m. after realizing that a complete loss of offsite power had not occurred.

Investigation by the licensee discovered that operation of the test circuit caused a surge out of the number four 250 VDC battery. This caused several high speed relays (4-8 msec.) in various circuit breakers to trip. The test had been performed in the past without any problems. A filter circuit on the battery was isolated. The circuit breaker for the filter circuit was apparently opened by operations personnel to check for grounds and was inadvertently left open. Test traces of the system with and without the filter circuit showed the spike that tripped the relays was suppressed with the filter circuit breaker closed.

The inspector informed plant personnel that an inspection open item is still open concerning the filter circuit breaker being open on Unit 1. The inspector had previously questioned this practice (259/84-44-02).

5. 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. MMI 28 — Directional Control Valve Replacement-rod 34-03, Unit 1

(See Inspection Report Nos. 50-259, 50-260, and 50-296/85-13 for discussion of problems identified as a result of this maintenance activity.)

b.	MMI 87	Limitorque Operator Maintenance
c.	Loss of offsite power	Troubleshooting Procedure (February 5, 1985).
d.	RTI 23	Feed pump control procedures Unit 3
e.	Residual Heat Removal Pump	"ID" replacement
f.	"D" diesel generator	Annual maintenance

6. Surveillance Testing Observation (61726)

The inspectors observed and/or reviewed the below listed surveillance procedures. The inspection consisted of a review of the procedure 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.

a.	S.I. 4.2.F.18	Main Steam Relief Valve Thermocouple and Acoustic Flow Monitor Surveillance
b.	O.I. 85	Control Rod Drive Operating Instruction
c.	S.I. 4.3.B.	Rod Coupling Integrity Check
d.	O.I. 30	Ventilation Operating Instruction
e.	Single Recirculation Loop Test (ST 8501)	Unit 1

While investigating the Unit 3 bottom drain temperature problem (see paragraph 9), the inspectors reviewed the surveillance procedure for a similar temperature element. Surveillance Instruction 4.2.F.18 "Main Steam Relief Valve Thermocouple and Acoustic Flow Monitor" includes monthly instrument check requirements for the relief valve tailpiece temperature elements. Technical Specification 4.2.F.17 requires comparing the thermocouple readings for all relief valves for "consistency and for nominal expected values." S.I.4.2.F.18 is intended to comply with this technical specification and also requires comparing the recorded value for each valve for consistency and for nominally expected values. The acceptance criteria given in the surveillance, however, does not provide guidelines on what constitutes consistency or what nominal values are expected. Failure to establish acceptance criteria to ascertain whether recorded values met the "consistency and nominally expected value" criteria is a violation of

Technical Specification 6.3.A. The licensee was informed of this violation at the exit on March 1, 1985, (259/260/296/85-09-01).

7. Reportable Occurrences (90712)

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
296/85-01	1-04-85	RCIC inoperable
296/85-04	1-22-85	Surveillance test late on CRD.

There were no violations in this area.

8. Followup of Unit 3 Bottom Drain Temperature (Open Item 296/85-06-06)

In January, 1985, the licensee discovered that the reactor vessel bottom drain temperature element (TE-56-8) was reading about 100°F lower than the Unit 1 element while both units were at full power. (See Inspection Report 85-06). The licensee took advantage of a short outage on February 10, 1985, to investigate the discrepancy and discovered that a valve was mispositioned. Manual valve 3-10-505, located inside the drywell, was found in a throttled open position instead of the fully open position. This reduced the flow of water from the rector vessel bottom drain line to the Reactor Water Clean Up system (RWCU) and resulted in a lower temperature at the bottom drain thermocouple due to reduced heat transfer. Valve 3-10-5050 was previously verified and second person verified fully open in September 1984, prior to startup from the last refueling outage. The Unit 3 reactor vessel bottom drain temperature returned to normal after the valve was fully opened and the unit was returned to power on February 14, 1985. This item is closed.

The inspectors researched Technical Specifications to determine the required surveillance for this temperature element to ascertain how long this condition could have gone unnoticed. Technical Specifications contain no minimum instrument channels or surveillance requirements for this element or other reactor vessel thermocouples. Further investigation by the resident discovered that no measures have been established by the licensee to assure the accuracy of the temperature element. This temperature element is used to obtain data in two technical specification surveillances which are required to assure the plant is operated within reactor vessel thermal limits during plant heatups, cooldowns, and recirculation pump start.

(T. S. 4.6.A.1 and 4.6.A.7). This item was discussed with plant management during a daily meeting on March 1, 1985.

This is an Inspector Followup Item: Calibration Requirements for Reactor Vessel Thermocouples (296/85-09-03).

9. Regulatory Performance Improvement Program (RPIP)

The responsible section chief reviewed the status of RPIP and actions taken by TVA to implement specific items as required by NRC Confirmatory Order EA 84-34 dated July 13, 1984. TVA has assigned a senior manager as RPIP Coordinator at the site. His responsibilities include verifying that each task has been implemented as described, has met objectives, and that the necessary programs are in place to insure that objectives will continue to be met. Most of the short term items have been indicated as complete, but have not been signed off as completed by the RPIP Coordinator. Based on the above review and interviews on February 26 and 27, 1985, the following items are considered closed:

Item No.	RPIP/No.	
84-SC-08	Short Term 2.2	Temporarily Freeze Issuance New/ Reused Division Procedures
84-SC-14	2.8	Procedures, Drawings, Materials and Tools Received Before Modifications Scheduled
84-SC-16	2.10	Redefine Priorities for Upcoming Outages
84-SC-20	3.3	Program Managers Provide Complete Packages to Plant Manager on Program to Meet Regulatory Requirements.
84-SC-26	3.9	Policy on Training/Disciplinary Action Involving Noncompliance
84-SC-28	4.1	Reorganization
84-SC-29	4.2	Training On New Organization

10. In-Office Review

IE Bulletin 79-07, (259/260/296/79-BU-07) 'Seismic Stress Analysis of Safety-Related Piping', is considered closed for the purposes of the Regional Inspection Program. This closure does not affect the status of any NRR evaluations. Related inspection followup will be performed as required by IE Bulletin 79-14, 'Seismic Analysis for As-Built Safety-Related Piping Systems'.

The following items were evaluated by the Reactor Safety, Radiation Safety and Safeguards, and Reactor Projects regional staff. Based on this review and the results of the latest Resident and Region based inspection activities in the affected functional areas, the following items were determined to require no additional specific followup and are closed.

a. Inspector Followup and Open Items

(296/78-30-01), Failure to Provide Corrective Action for Four Mechanical Restraints

(296/78-30-02), Prepare Procedure for Inspection of Spring Hangers

(296/78-30-04), Correct Snubber Conditions Listed in Paragraph five

b. Bulletins

(260/77-BU-06), Potential Problems with Containment Electrical Penetration Assemblies

c. Circulars

(259/260/296/81-CI-13), Torque Switch Electrical Bypass Circuit for Safeguard Service Valve Motors