

February 14, 2000

Tennessee Valley Authority  
ATTN: Mr. J. A. Scalice  
Chief Nuclear Officer and  
Executive Vice President  
6A Lookout Place  
1101 Market Street  
Chattanooga, TN 37402-2801

SUBJECT: NRC INTEGRATED INSPECTION REPORT NO. 50-390/99-11 AND  
50-391/99-11

Dear Mr. Scalice:

This refers to the inspection conducted on December 19, 1999, through January 29, 2000, at the Watts Bar facility. The enclosed report presents the results of this inspection.

During the inspection period, your conduct of activities at the Watts Bar facility was generally characterized by safety-conscious operations, sound engineering and maintenance practices, and careful radiological work controls.

Within the scope of the inspection, violations or deviations were not identified.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be placed in the NRC Public Document Room.

Should you have any questions concerning this letter, please contact us.

Sincerely,

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Paul E. Fredrickson, Chief  
Reactor Projects Branch 6  
Division of Reactor Projects

Docket Nos. 50-390, 50-391  
License No. NPF-90 and Construction  
Permit No. CPPR-92

Enclosure: NRC Inspection Report

TVA

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U.S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos: 50-390, 50-391  
License Nos: NPF-90 and Construction Permit CPPR-92

Report Nos: 50-390/99-11, 50-391/99-11

Licensee: Tennessee Valley Authority

Facility: Watts Bar, Units 1 and 2

Location: 1260 Nuclear Plant Road  
Spring City TN 37381

Dates: December 19, 1999, through January 29, 2000

Inspectors: P. Van Doorn, Senior Resident Inspector  
D. Rich, Resident Inspector  
D. Jones, Senior Health Physicist (Sections R1.2, R1.3  
and  
R1.4)

Approved by: P. E. Fredrickson, Chief  
Reactor Projects Branch 6  
Division of Reactor Projects

Enclosure

## EXECUTIVE SUMMARY

Watts Bar, Units 1 and 2  
NRC Inspection Report 50-390/99-11, 50-391/99-11

This integrated inspection included aspects of licensee operations, maintenance, engineering, and plant support. The report covers a six-week period of resident inspection and a regional radiological controls inspection.

### Operations

- The conduct of operations was professional and safety conscious. Requirements were met for control room conduct and other areas reviewed such as turnovers, tagouts, documentation, staffing, and assistant unit operator activities (Section O1.1).
- The Management Review Committee exhibited a questioning attitude regarding corrective action plans and adequacy of immediate corrective actions for problems associated with problem evaluation reports (PERs) initiations. Corrective action plans were typically thorough. The licensee demonstrated a low threshold for initiation of PERs. A Plant Operations Review Committee review was thorough and Nuclear Assurance observations were broad based with beneficial findings noted (Section O7.1).

### Maintenance

- Maintenance and surveillance activities observed were adequately performed. Maintenance personnel were knowledgeable and carefully followed procedures to resolve plant equipment and component problems. Work performed was typically well documented (Section M1.1).

### Engineering

- Engineering activities reviewed were thorough and technically viable. Plant equipment problems were being addressed commensurate with plant safety (Section E1.1).

### Plant Support

- Radiological controls were adequate. Radiological areas were properly posted and high radiation areas were labeled and locked. Personnel were attentive and followed requirements. A thorough brief was noted for a relatively high dose job in the transfer canal and radiological personnel provided thorough oversight of the activities. The licensee provided thorough oversight of chemistry results and limits reviewed were met (Section R1.1).
- The licensee had implemented an effective surveillance program for maintaining radioactive effluent monitoring instrumentation in an operable condition (Section R1.2).

- The surveillance requirements for demonstrating operability of the meteorological monitoring instrumentation were met (Section R1.3).
- The licensee demonstrated proper monitoring and controlling of personnel radiation exposure during the fuel transfer canal decontamination project (Section R1.4).
- Security personnel were attentive, followed requirements for access control, and problems were not identified with barriers and zones (Section S1.1).

## Report Details

### Summary of Plant Status

Unit 1 began this inspection period operating in Mode 1 at 100 percent reactor power. Reactor power remained at 100 percent for the remainder of the inspection period.

Unit 2 remained in a suspended construction status.

## I. Operations

### **O1 Conduct of Operations**

#### O1.1 General Comments (71707)

The inspectors conducted frequent inspections and reviews of ongoing plant operations. This included observation of routine control room (CR) crew activities and turnovers; review of logs, standing and night orders, CR staffing, and tagouts; and observation of assistant unit operator (AUO) activities.

The conduct of Operations was professional and safety conscious. Requirements were met for CR conduct and other areas reviewed such as turnovers, tagouts, documentation, staffing, and AUO activities.

### **O7 Quality Assurance In Operations**

#### O7.1 Licensee Self-Assessment Activities (40500)

The inspectors reviewed various self-assessment activities which included the following:

- Observation of Management Review Committee (MRC) meetings;
- Review of selected problem evaluation reports (PERs) for adequacy of corrective actions and implementation of procedural requirements;
- Review of PER initiations;
- Observation of a Plant Operations Review Committee (PORC) meeting; and
- Review of Nuclear Assurance (NA) observations and findings.

The MRC exhibited a questioning attitude regarding corrective action plans and adequacy of immediate corrective actions for problems associated with PER initiations. Corrective action plans were typically thorough, with one exception noted. The licensee demonstrated a low threshold for initiation of PERs. The PORC review was thorough and NA observations were broad-based with beneficial findings noted.

## **08 Miscellaneous Operations Issues**

### **O8.1 Generic Letter 98-02 (TI2515/142, 71707)**

#### Inspection Scope

The inspector reviewed the licensee's assessment performed in response to Generic Letter (GL) 98-02, Loss of Reactor Coolant Inventory and Associated Potential For Loss Of Emergency Mitigation Functions While In A Shutdown Condition, and verified parts of the licensee's Quality Assurance (QA) Program were implemented as described.

#### Observations and Findings

The licensee identified some vulnerabilities in the residual heat removal (RHR) system similar to those described in GL 98-02. The inspector independently reviewed emergency core cooling system drawings and verified that the licensee's review was complete and thorough. The licensee described operational controls already in use and, in one case, added an additional level of control. The licensee's response described features of their Appendix B QA Program that provide assurance that the safety-related functions of the RHR system and emergency core cooling system will not be adversely affected by activities conducted at hot shutdown. The inspector verified the training program addressed problems similar to those described in the GL 98-02 and verified procedural controls, operating practices, and operations command and control were accurately described in the licensee's response. The inspector had previously verified implementation of operational controls while in a hot shutdown condition and had documented findings identified in NRC Inspection Report 50-390,391/99-02, Section O1.3. The inspector verified the issues identified in that report were addressed by the licensee's corrective action program.

#### Conclusions

The licensee performed a thorough assessment of plant vulnerabilities similar to those described in GL 98-02. The inspector verified operational controls utilized and found that the licensee had adequately implemented elements of the QA Program described in the generic letter response.

## **II. Maintenance**

### **M1 Conduct of Maintenance**

#### **M1.1 General Comments**

##### **a. Inspection Scope (62707)**

The inspectors observed preplanned and emergent maintenance activities including all or portions of the following work orders (WOs) and surveillance instructions (SIs) and reviewed associated documentation:

- WO 99-1425100-000, Inspect, Clean, and Lubricate RHR Motor 1B-B, PMUG M6561V
- 1-SI-74-901B, 1B-B RHR Pump Performance Test, Revision 4
- WO 99-009783-000, Test and Calibration of 2B2-B 480V Auxiliary Board Undervoltage Relay, Time Delay Relay 27
- WO 99-018242-000, Troubleshoot and Repair/Replace 2B-B Diesel Generator Day Tank Level Switches
- 1-SI-211-4-A, 92 Day Trip Actuating Device Operational Test On Undervoltage Relays For 1A-A 6.9 KV Shutdown Board, Revision 4
- 1-SI-3-901-A, Motor Driven Auxiliary Feedwater Pump 1A-A Quarterly Performance Test, Revision 2
- 1-SI-99-10-A, 31 Day Functional Test of SSPS Train A and Reactor Trip Breaker A, Revision 4
- 1-SI-63-10-A, ECCS Pumps and Discharge Pipes Venting Train A, Revision 8
- WO 00-000028-000, Integrated Computer System Analog Card Points Have Hardware Read Error, Replace Gate Card Chassis 0-1-R-106
- 1-SI-62-901-A, Centrifugal Charging Pump 1A-A Quarterly Performance Test, Revision 6
- 0-SI-67-902-A, Essential Raw Cooling Water Pump B-A Performance Test, Revision 9

b. Observations and Findings

The inspectors observed the activities identified above and determined that personnel involved in the work were qualified and knowledgeable in the tasks being performed. The work instructions were observed being followed, and problems, if encountered during the performance of the work, were properly dispositioned. Work performed was also typically well documented. Where appropriate, radiation control measures were in place.

c. Conclusions

Maintenance and surveillance activities observed were adequately performed. Maintenance personnel were knowledgeable and carefully followed procedures to resolve plant equipment and component problems. Work performed was typically well documented.

### III. Engineering

#### **E1 Conduct of Engineering**

##### **E1.1 General Observations (37551)**

The inspectors observed Engineering support activities for PER evaluations, review of plant equipment problems and associated corrective action plans, and MRC and PORC meetings.

Engineering activities reviewed were thorough and technically viable. Plant equipment problems were being addressed commensurate with plant safety.

#### **E8 Miscellaneous Engineering Issues (92903)**

- E8.1 (Closed) Inspection Follow-Up Item 50-390/98-10-04: Reportability of WBPER950246.** WBPER950246 was written to resolve the issue of missing and broken sheet metal screws. TVA's corrective actions concerning this problem included a requested that Westinghouse perform an assessment of the data collected to ensure structural integrity of the IC baskets was acceptable. Westinghouse evaluation and analysis in WAT-D-10048 concluded that the IC was considered operable and the failure probability of the ice basket coupling due to the broken and missing screws is negligible. Based on Westinghouse's evaluation, TVA determined that the issues discussed in WBPER950246 was not reportable under 10 CFR 50.55(e) and subsequently closed the PER on August 10, 1995. 10 CFR 21 reportability requirements were also reviewed and determined not to be reportable as documented in NRC Inspection Report 99900404/98-02. In addition the Westinghouse and TVA metallurgical and structural tests, and WAT-D-10048 conclusions were also reviewed to further identify if the possibility exists that a deviation, associated with missing or cracked screws, could create a substantial safety concern.

On August 28, 1998, Westinghouse provided to the staff their evaluation of the cracked and/or missing IC sheet metal screws to determine if a defect had existed pursuant to the provisions of 10CFR21. The evaluation included metallurgical testing of the screws, supplied by the DC Cook facility, and tensile tests on ice baskets with a number of screws missing to simulate cracked or defective screws. The Westinghouse results of mechanical load testing on a full-size ice basket section and coupling ring with 4 screws missing in a 12-screw coupling connection demonstrated acceptable design margins.

Additional review and evaluation of IC screws at Watts Bar were documented in TVA report, "Watts Bar Nuclear Plant (WBNP) Evaluation of Ice Condenser Basket Screws," dated April 28, 1999. This report documented shear testing of additional randomly selected screws which were removed from service during the Unit 1 Cycle 2 outage along with new screws taken from the WBNP warehouse. The purpose of the test was to determine the effects of cracked and/or missing IC screws on structural integrity and conformance to the design basis. The licensee concluded that the tests demonstrated that the screws were capable of sustaining loads well above the minimum established by Westinghouse for both new and in-service screws at Watts Bar and that the screws

had sufficient structural integrity to withstand design basis load conditions. The NRC reviewed and witnessed a portion of the Unit 1 basket screw testing and documented the results in NRC Special Inspection Report 50-390, 391/99-06. The NRC review of the licensee's April 28, 1999 evaluation was completed on August 5, 1999, and documented in NRC Inspection Report 50-390, 391/99-08. The staff concluded that TVA had demonstrated that installed and warehouse screws could resist accident loads with up to 4 screws missing from a 12-screw coupling ring. The staff also concluded that the probability of having multiple screws missing from a coupling ring is small and that the IC basket operability was not impacted by the missing screws. The staff's review of the evaluation confirmed that significant margin was available to accommodate potential screw flaws in manufacturing batches. In addition the staff concluded that the flaws previously identified with IC screws in 1995, had not constituted a defect as defined in 10 CFR Part 21. In addition, since Westinghouse did not identify the possibility that the deviations could create a substantial safety hazard, Commission notification under 10CFR21 or 10CFR50.55e was not required. This item is closed.

#### **IV. Plant Support**

### **R1 Radiological Protection and Chemistry (RP&C) Controls**

#### **R1.1 General Comments (71750)**

The inspectors routinely observed radiologically controlled areas to verify adequacy of access controls, locked areas, personnel monitoring, surveys, and postings. The inspectors also routinely reviewed primary and secondary chemistry results.

Radiological controls were adequate. Radiological areas were properly posted and high radiation areas were labeled and locked. Personnel were attentive and followed requirements. A thorough brief was noted for a relatively high dose job in the transfer canal and radiological personnel provided thorough oversight of the activities. The licensee provided thorough oversight of chemistry results and limits reviewed were met.

#### **R1.2 Radioactive Effluent Monitoring Instrumentation**

##### **a. Inspection Scope (84750)**

The inspectors reviewed licensee's procedures and records pertaining to surveillances for selected radioactive effluent monitors. The surveillance procedures and records were evaluated for consistency with the operational and surveillance requirements for demonstrating the operability of the monitors. Those requirements were specified in sections 1/2.1.1 and 1/2.1.2 of the Offsite Dose Calculation Manual (ODCM).

##### **b. Observations and Findings**

The inspectors toured the control room and relevant areas of the plant to determine the operational status for the following effluent monitors.

- 0-RE-90-122 Liquid Radwaste Effluent Line

- 0-RE-90-212 Turbine Building Sump Effluent Line
- 1-RE-90-118 Waste Gas Disposal System Noble Gas Activity Monitor
- 1-RE-90-119 Condenser Vacuum Exhaust System Noble Gas Activity Monitor

The above monitors were found to be well maintained and operable at the time of the tours.

The inspectors reviewed 12 procedures related to channel checks, source checks, channel calibrations, and channel operational tests for the above listed monitors. The inspectors determined that the procedures included provisions for performing the required surveillances in accordance with the relevant sections of the ODCM and at the specified frequencies. The inspectors also reviewed recently completed surveillances for the above listed monitors. Those records indicated that the surveillances were being kept current and performed in accordance with their applicable procedures. Data compiled by the licensee from operations logs indicated that during calendar year 1999 the annual availability of the turbine building sump monitor was 91.5 percent and greater than 98 percent for the other three selected monitors. The most recent system status report for radiation monitoring (System 90) indicated that the overall system availability was 96 percent for the 4<sup>th</sup> quarter of fiscal year 1999.

The inspectors also observed segments of the calibration of condenser vacuum exhaust system noble gas activity monitor 1-RE-90-119. The inspectors noted that the calibration procedure was followed and the test acceptance criteria were met. The inspectors also verified that the required compensatory sampling was performed while the monitor was out-of-service for calibration.

c. Conclusions

The licensee had implemented an effective program for maintaining radioactive effluent monitoring instrumentation in an operable condition and for performing the required surveillances to demonstrate their operability.

R1.3 Meteorological Monitoring Program

a. Inspection Scope (84750)

The inspectors reviewed the licensee's procedures and records for the surveillances performed to demonstrate operability of the meteorological monitoring instrumentation as specified in section 1/2.1.3 of the ODCM and Section 2.3.3.2 of the Final Safety Analysis Report (FSAR), which described the operational phase of the meteorological monitoring program, indicated that the basic objective was to maintain data collection performance to assure at least 90 percent joint recoverability and availability of data needed for assessing concentrations and doses resulting from accidental or routine releases.

b. Observations and Findings

The inspectors reviewed meteorological surveillance procedures and determined that they included provisions for performing daily channel checks and semiannual channel calibrations. The inspectors also reviewed the licensee's records for calibration of the instrumentation used to monitor wind speed, wind direction, and air temperature at 10, 46, and 91 meters above ground level. Those records indicated that the instrument calibrations were current and had been performed in accordance with the applicable procedures. The inspectors reviewed recently completed control room surveillance logs and determined that channel checks of the meteorological monitoring instruments had been performed on a daily basis. During a tour of the control room the inspectors noted that the meteorological monitoring instrumentation was then currently operable.

During the afternoon of January 10, 2000, the inspectors observed calibration of selected meteorological monitoring instruments. The instruments were being re-calibrated due to a lightning strike the previous weekend. The inspectors noted that the calibration procedures were followed and the test acceptance criteria were met.

Licensee records for meteorological data collection performance indicated that the data recoverability was 96 percent for the 1<sup>st</sup> quarter of 1999, 94 percent for the 2<sup>nd</sup> quarter and 76 percent for the 3<sup>rd</sup> quarter. Data compilation was not complete for 4<sup>th</sup> quarter.

c. Conclusions

The surveillance requirements for demonstrating operability of the meteorological monitoring instrumentation were met. Performance with respect to collection of meteorological data decreased slightly during the third quarter of 1999.

R1.4 Occupational Radiation Exposure Control Program

a. Inspection Scope (83750)

The inspectors observed implementation of the licensee's radiation exposure controls during decontamination of the fuel transfer canal. Observed activities included personnel exposure monitoring, radiological surveys and postings, ALARA (As Low As Reasonably Achievable) practices and adherence to radiation work permits (RWPs). Those activities were evaluated for consistency with the programmatic requirements, personnel monitoring requirements, occupational dose limits, radiological posting requirements, and survey requirements specified in Subparts B, C, F, G, and J of 10 CFR 20.

b. Observations and Findings

The inspectors conducted frequent tours of the refuel floor area to observe radiation protection practices during decontamination of the fuel transfer canal. The inspectors noted that barriers were erected around the canal for access control and the area was properly posted for the radiological hazards. Personnel working in the area were wearing dosimetry and protective clothing as specified in the RWPs issued for the

project and health physics technicians were present to provide continuous coverage when work was in progress. Large area surveys of the refuel floor were frequently performed to quickly detect any hot particles which may have been released from the work area. Good ALARA practices for keeping contaminants from becoming airborne included maintaining the water in the canal above the areas which were being cleaned by use of a pressure washer and the use of an underwater vacuum/filter for collecting contaminated debris. As of January 14, 2000, personnel radiation were well within ALARA projections for the project.

c. Conclusions

The licensee was properly monitoring and controlling personnel radiation exposure during the fuel transfer canal decontamination project.

**S1 Conduct of Security and Safeguards Activities**

**S1.1 General Observations (71750)**

The inspectors routinely observed security activities for conformance to requirements which included protected area barriers, isolation zones, personnel access, and package inspections. Security personnel were attentive, followed requirements for access control, and problems were not identified with barriers and zones.

**V. Management Meetings**

**X1 Exit Meeting Summary**

The resident inspectors presented inspection findings and results to licensee management on February 1, 2000. The licensee acknowledged the findings presented.

The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

**PARTIAL LIST OF PERSONS CONTACTED**

**Licensee**

R. Beecken, Maintenance and Modifications Manager  
 D. Boone, Radiological Control Manager  
 L. Bryant, Assistant Plant Manager  
 S. Casteel, Radiological and Chemistry Control Manager  
 J. Cox, Training Manager  
 M. King, Acting Chemistry Manager  
 D. Kulisek, Operations Manager  
 W. Lagergren, Plant Manager  
 D. Nelson, Business and Work Performance Manager  
 P. Pace, Licensing and Industry Affairs Manager

R. Purcell, Site Vice President  
 J. Roden, Operations Superintendent  
 S. Spencer, Site Nuclear Assurance Manager  
 J. West, Acting Engineering Manager

### **NRC**

P. Van Doorn, Senior Resident Inspector  
 D. Rich, Resident Inspector

### **INSPECTION PROCEDURES USED**

IP 37551	Onsite Engineering
IP 40500	Effectiveness of Licensee Controls in Identifying, Resolving, and Preventing Problems
IP 61726	Surveillance Observations
IP 62707	Maintenance Observation
IP 71707	Plant Operations
IP 71750	Plant Support Activities
IP 83750	Occupational Radiation Exposure
IP 84750	Radioactive Waste Treatment, and Effluent and Environmental Monitoring
IP 92903	Follow up - Engineering

### **ITEMS OPENED, CLOSED AND DISCUSSED**

#### **Closed**

TI 2515/142		Draindown During Shutdown and Common Mode Failure (NRC Generic Letter 98-02) (Section O8.1).
50-390/98-10-04	IFI	Reportability of WBPER950246 (Section E8.1).