U.S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos:	50-390, 50-391
License No.:	NPF-90 and Construction Permit CPPR-92
Report Nos:	50-390/98-08, 50-391/98-08
Licensee:	Tennessee Valley Authority
Facility:	Watts Bar, Units 1 and 2
Location:	1260 Nuclear Plant Road Spring City TN 37381
Dates:	August 2 - September 12, 1998
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Enclosure

EXECUTIVE SUMMARY

Watts Bar Nuclear Power Plant, Units 1 and 2
NRC Inspection Report 50-390/98-08, 50-391/98-08

This integrated inspection included aspects of licensee operations, engineering, maintenance, and plant support. The report covers a six-week period of resident inspection; in addition, it includes the results of an announced inspection by three engineering reactor inspectors and the regional project engineer.

Operations

- In general, the conduct of Operations was professional and safety-conscious. One example of poor communications of management expectations to shift personnel was noted (Section O1.1).

- Operations responded in a timely manner to a condenser tube leak event. Operators maintained very good discipline regarding communications, procedure adherence, and alarm response (Section O1.2).

- The essential raw water cooling system lineup was correct and material condition was acceptable (Section O2.1).

- The licensee has continued to implement a thorough and self-critical approach to problems. A questioning attitude was evident at meetings. Corrective actions were typically thorough (Section O7.1).

Maintenance

- Observed maintenance and surveillance activities were adequately performed and Maintenance provided good support to resolve plant equipment or component problems. Work performed was typically well documented (Section M1.1).

- The licensee's Periodic Assessment met the requirements of the Maintenance Rule and was comprehensive (Section M1.2).

- Dehumidifiers in use for lay-up of Unit 2 equipment were operational and were adequately maintained. Preventive maintenance records indicated Unit 2 equipment was well-maintained and warehouse storage was adequate (Section M1.3).

- In general, completed surveillance documentation demonstrated acceptable test results (Section M1.4).

- The licensee's weekly surveillance of ice condenser intermediate deck doors demonstrated that the doors were ice free and operable as required by the applicable technical specifications (Section M1.6).

- Ice condenser sheet metal screws were properly procured and stored and only screws identified for use in the ice condenser baskets were issued to the craft for basket work (Section M1.7).

- The QA program and related procedures under which the metallurgical laboratory performed assigned tasks on safety-related material were appropriate. Based on the audit and personnel qualification review, technicians and engineers involved in the testing and supervision of technical, (i.e., metallurgical) activities were adequately qualified to perform their assigned tasks (Section M1.8).

- The licensee's program for maintenance and testing of reactor coolant system pressure isolation valves was acceptable. Review of leakage testing data indicated good material condition of these RCS isolation boundaries (Section M2.1).

- No problems were identified with respect to the licensee's program for testing of ASME Section XI Class 2 and 3 relief valves (Section M2.2).

Engineering

- Engineering support in the areas reviewed was generally thorough, timely, and technically viable. One example was noted where Engineering did not recognize or document the implications of an inadequate Technical Specification (Section E1.1).

- Engineering calculations to account for a possible error in the cold leg accumulator (CLA) level indicators inappropriately incorporated a 4.2 gallon design basis margin. This was non-conservative in maintaining the Technical Specification minimum CLA level. Engineering found another non-conservative error in the calculation but determined that the overall calculation was conservative (Section E1.2).

- Licensee evaluations of Ice Condenser problems for reportability were performed adequately (Section E4.1).

Plant Support

- Radiological controls were adequate. Personnel were attentive and met requirements. The licensee provided good management oversight of chemistry and regulatory limits were being met. The timely response to a condenser tube leak demonstrated excellent sensitivity to secondary chemistry parameters (Section R1.1).

- A minor violation was identified in that chemical sampling of the Ice Condenser was not representative, as defined by the Technical Specification. The licensee responded conservatively with resampling and showed that an operability problem did not exist (Section R3.1).

- The steam generator sample analyst was knowledgeable of applicable procedures and performed the sample and analysis in accordance with procedures. Laboratory equipment was clean and in good repair (Section R4.1).

- Security personnel performed acceptably, and barriers and zones were well-maintained (Section S1.1).

Report Details

Summary of Plant Status

Unit 1 began this inspection period operating in Mode 1 at 100 percent reactor power. On August 27 reactor power was first reduced to 50 percent to locate and plug leaking condenser tubes and then further reduced to 30 percent for steam generator hideout testing. Power was restored to 100 percent on August 28 and was maintained at 100 percent for the duration of the inspection period.

Unit 2 remained in a suspended construction status.

I. Operations

O1 Conduct of Operations

O1.1 General Comments (71707)

Using Inspection Procedure 71707, the inspectors conducted frequent inspections and reviews of ongoing plant operations. This included routine control room (CR) observations, crew turnover observations, review of tagouts, attendance at the daily planning meeting, and observation of assistant unit operator (AUO) rounds.

One negative finding was noted. Management expectations regarding use of cooling coils for the containment purge had not been effectively communicated to shift personnel. On August 12, 1998, the inspectors noted that containment purge had been initiated; however, use of cooling coils had not been initiated. Containment purging had been initiated due to high temperatures and humidity in containment as a result of a steam leak (see NRC Report 50-390/98-07, Section O2.2). The inspectors had been informed by management approximately one week earlier that the optional cooling coils would be used for more effective cooling of containment atmosphere. When questioned on August 12, management was not aware that the cooling coils had not been utilized and discovered that the expectations had not been effectively communicated to shift personnel. This was another example of weaknesses in communications to shift personnel previously highlighted (see NRC Report 50-390/98-07, Section O4.3).

In general, the conduct of Operations was professional and safety-conscious including crew turnovers, AUO rounds, and tagouts. One example of poor communications of management expectations to shift personnel was noted.

O1.2 Response to Condenser Tube Leak (71707)

On August 27, 1998, at 6:03 a.m., the licensee noted increasing sodium levels during secondary chemistry sampling. By 7:55 a.m., chemistry Action Level 2 had been reached which required a power reduction. At 08:11 a.m., the load decrease was initiated. The inspectors conducted extended observations of operators during the downpower activities and portions of the subsequent return to power.

Operations responded in a timely manner to the condenser tube leak event. Although the CR was very busy during the power excursions, operators maintained very good discipline regarding communications, procedure adherence, and alarm response.

02 Operational Status of Facilities and Equipment

02.1 Engineered Safety Feature System Walkdowns (71707)

The inspectors used Inspection Procedure 71707 to walk down portions of the emergency raw cooling water system. Equipment operability, material condition, and housekeeping were acceptable. The inspectors identified no concerns as a result of these walkdowns.

07 Quality Assurance in Operations

07.1 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;
- Observation of two Plant Operations Review Committee (PORC) meetings;

The licensee has continued to implement a thorough and self-critical approach to problems. A questioning attitude was evident at meetings. Corrective actions were typically thorough.

II. Maintenance

M1 Conduct of Maintenance

M1.1 General Comments

a. Inspection Scope (62707) (61726)

Using Inspection Procedures 62707 and 61726, the inspectors observed all or portions of the following work orders (WOs) and surveillance instructions (SIs) and reviewed associated documentation:

- WO 97-017204-000, Change Out of Diesel Generator Emergency Supply Breaker for the 1B-B 6.9KV Shutdown Board - Panel 6
- 0-SI-82-11-B, Monthly Diesel Generator Start and Load Test DG 1B-B, Revision 4

- TI 50.043 1B-B Diesel Generator Starting Air System Check Valve Test, Revision 1
- 1-SI-3-914, Motor Driven Auxiliary Feedwater Pump 1A-A Suction Check Valve Testing During Operation, Revision 1
- 1-SI-99-10-A, 31 Day Functional Test of SSPS Train A and Reactor Trip Breaker A, Revision 3
- WO 98-007100, Repair 1B-B SI Pump 6900 kV Breaker Elevator
- 1-SI-63-901-B, Safety Injection Pump 1B-B Quarterly Performance Test, Revision 4
- 0-SI-82-12-B, Monthly Diesel Generator Start and Load Test DG 2B-B, Revision 4
- WO 98-011732-000, Repair/Replace 1-LCV-3-174 Positioner
- WO 98-01078-000, Repair Leaking Component Cooling Water Casing Drain Valve 2-DRV-070-0721A
- 0-SI-82-12-B, Monthly Diesel Generator Start and Load Test DG 2B-B
- 1-SI-3-902, Turbine Driven Auxiliary Feedwater Pump 1A-S Quarterly Performance Test

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. The pre-job briefings were effective in describing work coordination and task overview.

The test results for the 1B-B Diesel Generator (DG) Fast Start Test and Monthly Load Operability Test met Technical Specification (TS) Surveillance Requirements (SRs) 3.8.1.7 and 3.8.1.3, respectively. Communications between Operations personnel in the main CR and those in the Diesel Generator (DG) building were good. Maintenance preparations and functional checkout of the 1B-B DG output breaker prior to installation were performed well.

During the performance of the Fast Start 2B-B DG Test, the inspectors noted an instrument cart in close proximity of the 2B-B DG relay panel with the wheels not locked. Although the equipment on the cart was employed as part of the fast start test, the cart was not in continuous sight of the responsible field personnel, as those personnel left the room on several occasions during the test. This is contrary to the

licensee's Site Standard Practice (SSP)-12.07A, Temporary Equipment Control, Revision 1, paragraphs 2.6 and 4.0 A. This constitutes a violation of minor significance and is not subject to formal enforcement action. The licensee initiated Problem Evaluation Report (PER) WBPER981004 to address this issue.

c. Conclusions

Twelve maintenance and surveillance activities were adequately performed, and Maintenance provided good support to resolve plant equipment or component problems. Work performed was typically well documented.

M1.2 Maintenance Rule Periodic Assessment

a. Inspection Scope (62706)

Paragraph (a)(3) of the Maintenance Rule requires that performance and condition monitoring activities and associated goals and preventive maintenance activities be evaluated taking into account, where practical, industry-wide operating experience. This evaluation was required to be performed at least one time during each refueling cycle, not to exceed 24 months between evaluations. The inspectors reviewed the licensee's Maintenance Rule Periodic Assessment (MRPA) report.

b. Observations and Findings

At the time of the Maintenance Rule Baseline Inspection (MRBI) conducted May 18-22, 1998, the licensee had yet to complete its MRPA. At that time, the licensee informed the MRBI team that it assessed its Maintenance Rule structures, systems, or components (SSCs) on a quarterly basis and the quarterly System Status Reports, or "Health Reports," would constitute its MRPA. The team informed the licensee that instead of a quarterly frequency, the MRPA was intended to be a summary report of plant maintenance monitoring for a fuel cycle, a period not to exceed two years, addressing the topics in and providing documentation as indicated in NUMARC 93-01, Nuclear Energy Institute Industry Guidelines for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants, Revision 2, Sections 12 and 13.

The licensee completed its MRPA for Watts Bar on July 9, 1998. This assessment covered the portion of Operating Cycle No. 1 after July 10, 1996, and the portion of Operating Cycle No. 2 before March 31, 1998, a period of approximately 21 months. The inspectors found the assessment to be comprehensive.

The MRPA addressed all the topics of NUMARC 93-01, Section 12.0, Periodic Maintenance Effectiveness Assessments, except for the evaluation of "each goal for its continued applicability." The licensee indicated that it had previously assessed the effectiveness of corrective actions (a sub-set of goals). The licensee stated that as

there were no recommended changes to corrective actions for (a)(1) SSCs, by inference, the goals are still applicable. The licensee amended the MRPA to address the continued applicability of both the corrective action aspects and the monitoring aspects of (a)(1) goals.

c. Conclusions

The inspectors concluded that the licensee's MRPA met the requirements of the Maintenance Rule. The inspectors found the assessment to be comprehensive. The assessment did not document the evaluation of continued applicability of goals.

M1.3 Unit 2 Lay-Up Program (62707)

a. Inspection Scope

The inspectors conducted an inspection of the licensee's lay-up program established for Unit 2. The inspection included interviews of licensee personnel, inspection of installed equipment, inspection of equipment in warehouse storage, and review of preventive maintenance actions.

b. Observations and Findings

Personnel interviewed were knowledgeable of lay-up requirements and familiar with equipment status. The inspectors inspected Unit 2 equipment in the turbine building, auxiliary building, and Unit 2 reactor building. The inspectors verified that dehumidifiers connected to installed equipment were operational and hoses were in satisfactory condition. Minor deficiencies were corrected by the licensee. The inspector reviewed records of inspections and humidity samples performed in accordance with Construction Administrative Instruction (CAI)-1.02, Preventive Maintenance for Non-Transferred Features, Revision 11, and found preventive maintenance performance and disposition of minor deficiencies documented. The inspectors noted that equipment in warehouse storage was tagged for identification and that sensitive equipment was maintained inside atmospherically controlled facilities.

c. Conclusions

Dehumidifiers in use for lay-up of Unit 2 equipment were operational and were adequately maintained. Preventive maintenance records indicated that Unit 2 equipment was well-maintained and warehouse storage was adequate.

M1.4 Review of Completed Surveillance Test Packages (61726)

a. Inspection Scope

The inspectors reviewed selected completed surveillance test packages to verify that the documentation satisfied the referenced TS surveillance requirements (SRs).

b. Observations and Findings

The inspector reviewed test package documentation for the most recent performance of the following Surveillance Instructions (SIs):

- 1-SI-61-1, Determination of Boron and PH on Ice Condenser Basket Ice.
- 1-SI-61-3, 18 Month Ice Condenser Flow Passages Inspection
- 1-SI-61-5, 18 Month Condenser Intermediate Deck Doors Inspection
- 1-SI-61-6, Weekly Ice Condenser Intermediate Deck Doors Visual Inspection
- 1-SI-61-7, 18 Month Ice Condenser Intermediate Deck Doors Operational Check
- 1-SI-61-8, 92 Day Ice Condenser Top Deck Doors Visual Inspection
- 1-SI-61-9, 18 Month Ice Condenser Floor Drains Visual Inspection
- 1-SI-0-902, Testing Setpoint of Safety Relief Valves - ASME Section XI Category "C" Valves
- 1-SI-0-903, Primary Pressure Boundary Isolation Valve Leak Test (Boron Injection Primary and SI/RHR Hot Leg Injection Check Valves)
- 1-SI-0-904, Primary Pressure Boundary Isolation Valve Leak Test (Residual Heat Removal Cold Leg Injection Check Valves)
- 1-SI-0-905, Primary Pressure Boundary Isolation Valve Leak Test (Residual Heat Removal Return Valves)
- 1-SI-0-906, Primary Pressure Boundary Isolation Valve Leak Test (Safety Injection Secondary Check Valves)

For those completed SI test packages reviewed, except for 1-SI-61-1, further discussed in Section R3.1, the TS SR referenced by the licensee's SI had been satisfied. Completed surveillance test packages demonstrated acceptable test results. No problems were identified with completed surveillance packages reviewed.

c. Conclusions

Completed IC surveillance documentation demonstrated acceptable test results in all cases but one involving random chemistry sampling, further discussed in Section R3.1. Completed surveillance test packages (other than the one IC SI) demonstrated acceptable test results.

M1.5 Ice Condenser Inspection - General (62700)

This inspection was performed while the plant was in Mode 1 and consisted of reviews of past ice condenser (IC) surveillances, storage and control of IC sheet metal screws, observation of IC intermediate deck door inspection/testing and inspection of the licensee's Central Laboratory Services (CLS) facility. In general, this work effort determined that the licensee was appropriating adequate resources and management attention in support of these activities (see sections M1.6, M1.7 and M1.8).

Maintenance supervision responsible for servicing the IC exhibited a relatively high degree of oversight and accountability for performing quality work. System engineering oversight was considered to be good with personnel actively pursuing resolution of identified technical problems in a conservative manner.

M1.6 Ice Condenser Intermediate Deck Door Surveillance

a. Inspection Scope (62700)

The inspectors determined by observation, review of completed surveillance records, procedures, and discussions with cognizant engineering personnel the adequacy of surveillances performed on the intermediate deck doors.

b. Observations and Findings

Intermediate Deck Door Surveillance Background

Technical Specification (TS) 3.6.12.2 requires that every seven days each intermediate deck door be visually inspected to verify that it is closed and not impaired by ice, frost or debris. This surveillance was performed in accordance with Procedure 1-SI-61-6, Rev. 3, Weekly Ice Condenser Intermediate Deck Doors Visual Inspection. This procedure listed the aforementioned TS 3.6.12.2 and TS 3.6.12.6 requirements. The latter provides for verifying once every 18 months, freedom of door movement. This test is accomplished by lifting the door and measuring the lifting force applied to determine compliance with the aforementioned TS requirements. NRC review of this surveillance is periodically conducted and has been documented in Inspection Reports 50-390,391/98-04 and 97-05.

Implementation

Through discussions and document review, the inspectors determined that soon after plant startup from the R01 refueling outage, the containment had exhibited high humidity levels. On July 24, 1998, visual inspection determined the source of this problem was leakage from No. 4 steam generator (SG), No. 2 man way, adjacent to the SG enclosure wall. This problem raised the relative humidity (RH) both inside the containment and the ice condenser. This problem and the corrective

actions both temporary and permanent, planned and taken to remedy the situation were documented in PER WBPER980798, Rev. 0, July 10, 1998, and are further discussed in Section E8.2.

One of the corrective actions taken to monitor the impact of the high RH on the IC doors was to perform increased surveillances eventually leading to twice-daily surveillances using the subject procedure. The objective of the surveillance was to look for ice or frost accumulation around the intermediate deck doors and upper deck blankets and to assure that the doors were free to open under design basis accident (DBA) conditions. As stated earlier, this surveillance was implemented on a twice-daily basis and as conditions improved, (i.e., no ice buildup on doors or hinges) the surveillance was reduced to weekly. This reduction in frequency was in part due to the use of the upper containment coolers and other measures that proved successful in reducing the amount of RH in the upper containment and ice buildup on the intermediate deck doors and upper deck blankets.

The inspectors performed an independent inspection of the intermediate deck doors which included such attributes as ice buildup on the top and bottom of the doors, on the hinges, on the rubber door seals and the force required to lift certain doors to assess compliance with applicable TS requirements. Inspection of the upper deck blankets with the aid of the polar crane showed a small amount of moisture was present on the top side of certain blankets. There was no physical evidence of material deterioration. The seams between the blankets had been taped with new tape material in order to prevent moisture intrusion. Also the inspectors observed that the blankets and the tape material were adequately secured with appropriate clips. The bottom side of the blankets, as viewed from the intermediate deck, appeared to be free of ice or moisture.

c. Conclusion

The licensee's weekly surveillance of ice condenser intermediate deck doors demonstrated that the doors were ice free and operable as required by the applicable technical specifications. The licensee had taken adequate interim steps to control the relatively high humidity problem and had made preparations to implement a permanent fix during the first opportunity.

M1.7 Storage and Control of IC Basket Screws

a. Inspection Scope (62700)

The inspectors determined by inspection, document review and through discussions with cognizant personnel the adequacy of IC sheet metal screw storage and control.

b. Observation and Findings

By observation and document review the inspectors verified that the licensee's inventory of about 30,000 IC basket sheetmetal screws were procured from Westinghouse Electric Company (W), under Purchase Order (PO) No. 544CXD290708 for Unit 2 and were received on February 17, 1989. The screws were manufactured by Great Lakes Company to meet the W Equipment Specification 678956, Rev. 4, dated June 11, 1974. This specification required that the screws be made from ASTM-1022 carbon steel material; and that they are thermally treated to a surface hardness of 52 Rockwell C (RC) scale, with a core hardness in the range of RC 32-40. The screws were #10-32 x ½" long and were self-tapping with a head height between 0.112" to 0.127". The screws were coated with zinc phosphate material as required by the applicable specification.

In the issue station, the inspectors determined that the subject screws were stored under QA level 2 requirements. They were specifically identified under the TVA Item Identification Code (TIIC) program and were stored in a bin dedicated for their storage. Screws were issued to authorized personnel for work on specific ice condenser baskets which was controlled by applicable work orders (WOs). Material was issued using TVA Form 575s, Material Issue Request. This form identifies the item on the WO, a description of the item withdrawn including its TIIC number, procurement number, the quantity (i.e., number of screws withdrawn), and the date.

The inspectors reviewed ice basket sheetmetal screws issued under WOs 95-02791-00, January 21, 1995, and 95-02728-00, dated January 31, 1995 and verified satisfactory control of ice basket screw issuance.

c. Conclusion

The inspectors found that the screws were adequately procured, stored and controlled, and that only screws identified for use in the ice condenser baskets were issued to the craft for basket work.

M1.8 Inspection of Licensee Central Laboratory Services (CLS) Facility

a. Inspection Scope (62700)

The inspectors evaluated by observation, discussions and document review the operation of the licensee's CLS facility and its qualification to perform testing on safety-related material.

b. Observation and Findings

The inspectors performed a walk-through inspection of the CLS facility and discussed with management and supervision its operation as it related to 10 CFR 50, Appendix B, requirements and safety-related material. Within these areas the inspectors determined that CLS provided various services including calibration of equipment, chemical

analysis, testing and material failure investigations. CLS operates as an independent organization and provides the aforementioned services to nuclear and non-nuclear facilities. The Metallurgical Services Section operates under the direction of the Vice President for Fossil Operations. Resolution of metallurgical issues is the responsibility of the Chief Metallurgical and Codes Engineer who reports to the Engineering & Technical Support Vice President. Work performed by CLS for nuclear safety-related applications is controlled by the approved Quality Program Manual, Rev. 23, dated April 14, 1997, and ANSI/ASME N45.2 Quality Assurance Program Requirements for Nuclear Power Plants. Work performed on the above-mentioned applications is controlled by the CLS Quality Program Instruction Manual. The CLS is an approved vendor for technical support services to TVA and to other organizations in the industry. CLS is audited by TVA and industry customers on a periodic basis, following the auditing practices of the Nuclear Procurement Issues Committee (NUPIC). The QA program requires that all department personnel performing or supervising quality related activities be trained and meet the requirements of the QA Orientation and Technical Training procedure, CLS-QAP11.1.

Within these areas the inspectors reviewed selected audit reports and determined that personnel training and qualifications were covered by vendor audits. The following audit reports included in this review were:

97V-27	Laboratory Testing services and Calibration of Measuring and Test Equipment Supplier, May 19-23 and 28, 1997.
A-SE-97-009	Evaluation of TVA's QA Program in Providing Calibration Services, August 12-14, 1997.
97-TVA-05	TVA Central Laboratory Services, QA Program for Calibration Services, September 8-9, 1997.

In addition, the inspectors reviewed qualifications and training records for technicians and engineers working in the metallurgical laboratory. The metallurgical laboratory has a staff of four metallurgical engineers and two technicians with engineering associates degrees. The two technicians performed their assigned tasks under the direction of a metallurgical engineer. The records showed that the staff had received training in various areas including 10 CFR 21 and 10 CFR 50, Appendix B, QA criteria requirements. Also, the inspectors noted that the staff received periodic evaluation and reviews on their qualification to perform assigned tasks including mechanical testing, chemical analysis and to prepare reports on the results obtained. The inspectors determined that the records reviewed were current, satisfactory and retrievable.

c. Conclusion

The QA program and related procedures under which the metallurgical laboratory performed assigned tasks on safety-related material were appropriate. Based on the audit and personnel qualification review, technicians and engineers involved in the testing and supervision of technical, (i.e., metallurgical) activities were adequately qualified to perform their assigned tasks.

M2 Maintenance and Material Condition of Facilities and Equipment

M2.1 Maintenance/Material Condition of RCS Pressure Isolation Valves (62700)

a. Inspection Scope

The inspectors reviewed the licensee's program for maintenance and testing of selected Reactor Coolant System (RCS) pressure isolation valves (PIVs) to determine the adequacy of that program for maintaining the integrity of those RCS isolation boundaries. The inspectors also verified that the licensee's program for testing of those isolation valves satisfied TS SR 3.4.14.1 for verification of RCS PIV leakage and TS 5.7.2.11 for inspections of check valves. The inspectors reviewed available documentation associated with previously known problems in this area. In addition, the inspectors reviewed maintenance work packages and post-maintenance test documentation for completed work on selected isolation valves.

b. Observations and Findings

The inspectors reviewed machinery history and leak testing data for selected RCS PIVs to evaluate the adequacy of the licensee's program for maintaining the integrity of those RCS isolation boundaries. Isolation valves selected for review consisted of important isolation valves, including check valves, which, if failed, could result in an interfacing system loss of coolant accident (IS-LOCA). The inspectors reviewed the licensee's surveillance procedures for periodic leak rate testing of PIVs. The inspectors reviewed available as-found leakage test data for selected valves from testing performed by the licensee during the October 1996 mid-cycle outage and the 1997 RF01 refueling outage on September 19, 1997. Specific leakage test surveillances reviewed were listed in Section M1.4. The inspectors noted that each of the licensee's leakage testing procedures required that a corrected value for valve leakage be calculated for the RCS at 2235 psig. This corrected leakage value was required to be used rather than the actual observed leakage values anytime testing involved a lower test pressure. The inspectors also reviewed selected maintenance procedures used by the licensee for disassembly and inspection of check valves required by TS 5.7.2.11 and the licensee's Inservice Testing (IST) Program.

The inspectors determined that very few problems or failures had been identified by the licensee during the first operating cycle. Several RCS pressure isolation check valves would not pass their required seat leakage criteria following startup testing and prior to reactor startup. This had occurred during August 1995 while the licensee was performing initial PIV leak testing. However, the licensee determined that those check valves had been warped by welding stresses during installation. This had resulted in the seats being twisted, preventing adequate seat contact. The check valve seats were resurfaced to provide adequate seating contact. All valves were subsequently retested acceptably prior to initial fuel load. During the October 1996 mid-cycle outage, all RCS PIVs were tested for leakage with only one check valve failing to satisfy leakage criteria. During the 1997 RF01 refueling outage on September 19, 1997, all RCS PIVs were tested. Two check valves, 1-CHV-063-0547-B and 1-CHV-063-05479-B, initially showed leak rates in excess of their assigned values. However, after flushing, both valves seated and successfully passed their seat leakage tests.

During the October 1996 mid-cycle outage, check valve 1-CHV-063-640-S experienced inconsistent test results and maintenance was performed on the check valve. The inspectors reviewed WO 96-017409-00, which documented repairs of the check valve including disassembly and replacement of valve internals. The inspectors verified that the completed work package included applicable portions of SI 1-SI-0-906, which demonstrated performance of satisfactory leak rate testing as post-maintenance testing.

The licensee had previously identified that the Number 2 RCS Cold Leg Accumulator Check Valve, 1-CHV-063-632-A, was experiencing leakage requiring routine recharging of the accumulator. This problem was identified by the licensee within six weeks after startup from the RF01 refueling outage. The licensee had evaluated the leakage, which was pressurizing the Residual Heat Removal (RHR) pump discharge headers, and determined that the leakage from the RCS secondary pressure boundary valve was minimal, estimated to be 0.15 gallons per minute (gpm) maximum extrapolated to system pressure. The allowed leakage was 3.0 gpm. The inspectors determined that this leakage was not safety significant.

The inspector verified that the licensee's program for maintenance and testing of PIVs was acceptable and that leakage testing had satisfied the TS requirements. No problems were identified during the inspectors' review in this area.

c. Conclusions

The licensee's program for maintenance and testing of RCS PIVs was acceptable. No examples of inadequate maintenance were identified during this review. No problems were identified during review of machinery history which would indicate an adverse trend or degradation of the material condition of RCS PIVs. Review of leakage testing data indicated good material condition of these RCS isolation boundaries.

M2.2 Testing of ASME Section XI Class 2 and 3 Relief Valves (62700)

a. Inspection Scope

The inspectors reviewed the licensee's program for testing of American Society of Mechanical Engineers (ASME) Section XI Class 2 and 3 relief valves to verify that the program satisfied requirements of ASME/ANSI OM-1987, Operation and Maintenance of Nuclear Power Plants. Verification of correct lift setpoints for these relief valves was necessary to insure proper operation of Emergency Core Cooling Systems (ECCS) and because of the potential impact of improper lift setpoints on a postulated IS-LOCA event. In addition, the inspectors reviewed Watts Bar actions associated with Sequoyah PER SQN971707PER, which documented an inadequate evaluation of an improper as-found lift pressure setpoint for a safety injection system relief valve.

b. Observations and Findings

ASME Section XI Class 2 and 3 relief valves at Watts Bar included a large number of smaller relief valves in various systems such as safety injection, RHR, and chemical and volume control system (CVCS). The inspector reviewed documentation for all Class 2 and 3 relief valves in the Safety Injection and RHR systems that had been tested during RF01 Refueling outage. The specific relief valve test surveillance reviewed by the inspector is listed in Section M1.4. The inspectors determined that the licensee had checked a sufficient number of relief valves from each group (as selected by vendor, valve model, and application) to satisfy sampling requirements from ASME/ANSI OM-1987, Part 1, Requirements for Inservice Performance Testing of Nuclear Power Plant Pressure Relief Devices. No problems were noted during this review. In addition, the inspectors noted that there were no as-found failures of relief valves checked during the RF01 outage.

The inspectors also reviewed Watts Bar actions associated with Sequoyah PER SQN971707PER, which documented an inadequate evaluation of an improper as-found lift pressure setpoint for a safety injection system relief valve. The inspector noted that the Sequoyah PER had been reviewed by the site for generic applicability.

c. Conclusions

No problems were identified with respect to the licensee's program for testing of ASME Section XI Class 2 and 3 relief valves.

M8 Miscellaneous Maintenance Issues (92902)

M8.1 (Closed) Violation (VIO) 50-390/98-05-02: Failure to Establish Adequate Performance Criteria for SSCs Under the Maintenance Rule. NRC Letter dated July 6, 1998, which transmitted Inspection Report 50-390/98-05, stated relative to this violation "...the corrective actions taken and planned to correct the violation and prevent recurrence is already

adequately addressed on the docket..." The licensee addressed its corrective actions to this violation in WBPER980916. The inspectors verified that the corrective actions indicated in WBPER980916 were complete.

III. Engineering

E1 Conduct of Engineering

E1.1 General Observations (37551)

The inspectors observed Engineering support activities for Ice Condenser issues along with other activities such as Management Review Committee (MRC) and Plant Operations Review Committee (PORC) meetings.

Good support was noted in the areas reviewed. Evaluations were thorough and technically viable. The inspectors identified that documentation on one PER poorly described the implications of an inadequate TS for the Ice Condenser. WBPER980742 documented that the TS for flow blockage (SR 3.6.11.4) was not conservative. The TS implied that a 0.38 inch accumulation of frost or ice on all surfaces was acceptable. Contributing to this problem was a poor understanding of the technical basis for the TS and poor coordination with the licensee's vendor during TS development. The PER did not address that other TSs may need to be evaluated for similar problems. Although this specific PER did not document the need to evaluate other TSs, the licensee was already in the process of assessing all ice condenser issues and TS implementation due to recent industry problems.

Engineering support in the areas reviewed was generally thorough, timely, and technically viable. One example was noted where Engineering did not recognize or document the implications of an inadequate TS.

E1.2 Evaluation of Inaccuracy of Rosemount Level Indicators

a. Inspection Scope (37551)

The inspectors reviewed an Engineering assessment of a potential Rosemount level indicator inaccuracy.

b. Observations and Findings

Engineering identified that the safety injection cold leg accumulator (CLA) Rosemount level indicators had a potential to be in error due to evaporative loss from the reference leg reservoir. During operation, evaporative losses are minimal due to the normal pressure of the CLAs. During an outage, however, when the CLAs remained depressurized, evaporative losses from the reference leg can be significant. To compensate for this, the reference legs should be refilled after the CLAs are pressurized. This requirement was not included in maintenance or operations procedures and was not performed during the last outage. In Watts Bar PER WBPER980944, Engineering documented the maximum

indication error from evaporative losses from the reference leg to be 16.4 gallons. Because this potential error would cause the indicated level to be higher than the actual level, Engineering recommended that a margin be added to the CLA lower TS limit of 7717 gallons.

Engineering reviewed the basis for the lower TS limit of 7717 gal and calculated that, in addition to original instrument error, there was a 4.2 gal margin between the lower design basis limit of 7627 gal and the TS limit. Therefore, instead of recommending 16.4 gal added as a margin to the lower TS limit, Engineering only recommended adding 13 gal as a margin. Operations utilized an indicated level of 7730 gal as the lower CLA limit.

The inspectors reviewed the calculations and pointed out that if indicated CLA level was 7730 gal with a 16.4 gal error, then, although actual level would still be above the design basis minimum, level would be below the TS minimum. As a result, Engineering changed the recommended minimum tank level to 7734 gal and initiated a detailed review of the calculation. After another non-conservative error and several overly conservative assumptions were identified, Engineering's final assessment of the maximum possible instrument error resulting from not refilling the reference leg after pressurizing the CLA was an error of only 6.68 gal greater than actual level, verses the previously calculated 13 gal margin. As corrective action, Maintenance planned to refill the Rosemount reference legs during operation. Necessary changes to Maintenance and Operations instructions to prevent recurrence were being evaluated under the corrective action plan to WBPER980944.

c. Conclusions

Engineering calculations to account for a possible error in the CLA level indicators inappropriately incorporated a 4.2 gal design basis margin. This was non-conservative in maintaining the TS minimum CLA level. Engineering found another non-conservative error in the calculation but determined that the overall calculation was conservative.

E4 Engineering Staff Knowledge and Performance

E4.1 Ice Condenser Reportability Evaluations

a. Inspection Scope (37551) (92903)

The inspectors reviewed Ice Condenser PERs to evaluate whether personnel had adequately evaluated the issues for reportability to NRC.

b. Observations and Findings

The licensee's list of approximately 60 PERs initiated for the Ice Condenser since November 1995 was reviewed for possible reportable problems in accordance with 10 CFR 50.73. Several issues were still under evaluation. Eight of the completed PERs, which appeared to cover

possible reportable issues were selected for more detailed review. Only one reportable issue, was noted in WBPER96356 which had been properly reported in Licensee Event Report (LER) 50-390/96018, Inadequate Performance of a Ice Condenser Surveillance Requirement. In addition, the licensee indicated that the lack of representative chemistry sampling described in WBPER981006 would be considered an inadequate surveillance and would be reported (see Section R3.1).

c. Conclusions

Licensee evaluations of Ice Condenser problems for reportability were performed adequately.

E8 Miscellaneous Engineering Issues (92903)

E8.1 (Closed) Unresolved Item (URI) 50-390/98-04-03: Ice Condenser Flow Passages. This issue involved the fact that blockage had been found on some of the flow passages which required further evaluation. This issue has been documented in WBPER980424. The licensee recently conducted a reinspection for flow blockage from the upper plenum, which the inspectors observed. The inspectors also reviewed the final inspection results and reviewed recent guidance received from the licensee's Nuclear Steam Supply System (NSSS) vendor, Westinghouse, contained in letter WAT-D-10549, dated August 27, 1998. The licensee had previously recognized that the blockage TS could be interpreted in a non-conservative manner, which was documented in WBPER980742. The most recent guidance indicates that a more appropriate standard is 15 percent maximum blockage for each of six zones in the Ice Condenser. The recent results confirmed that the 15 percent criteria had been met. The licensee indicated that the TS bases would be clarified in the short term and a longer term action to change the TS to conform to design basis requirements would be initiated. This item is closed. No regulatory non-compliance and no operability concern was identified.

E8.2 (Open) URI 50-390/98-07-01: Evaluation of Ice Condenser Problems Due to Moisture in Containment. This issue involved problems such as condensation on upper blankets and icing on intermediate deck doors due to high moisture in containment. The licensee continued to experience icing on intermediate deck doors during the inspection period. Surveillances and ice removal were increased to as much as twice per day to assure that doors remained operational. Several actions such as swapping of control rod drive mechanism fans and actuation of containment purge were initiated to help reduce temperature and moisture. Improvement was noted and the surveillance interval was returned to weekly at the end of the period, with only 10 pounds of ice removed with no door impairments noted during the last surveillance. The licensee was in the process of clarifying the TS for this surveillance regarding how many doors could be impaired and still meet the design basis. The inspectors asked one additional question concerning possible water saturated upper blankets. This was whether additional stresses on hinges during opening of the blankets during a postulated event could damage the hinges and result in separation of the

blankets. The licensee indicated that this concern would be reviewed. This item remains open pending further licensee review and corrective actions.

IV. Plant Support

R1 Radiological Protection and Chemistry (RP&C) Controls

R1.1 General Observations (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 chemistry results including weekly RCS tritium.

Radiological controls were adequate. Personnel were attentive and met requirements. The licensee provided good management oversight of chemistry and regulatory limits were being met. The timely response to a condenser tube leak demonstrated excellent sensitivity to secondary chemistry parameters.

R3 RP&C Procedures and Documentation

R3.1 Ice Condenser Chemical Sampling

a. Inspection Scope (61726) (71750)

The inspectors reviewed recent chemistry sample results for TS SR 3.6.11.5. This TS requires chemical analyses of at least nine representative samples of stored ice. The licensee indicated that, upon review of the results prior to providing these to NRC, the previous samples were not representative in that the first nine bays had been sampled each time although different baskets had been selected. The licensee also indicated that it was in the process of conducting a self-assessment of Ice Condenser surveillances and had identified the need to clarify the sampling technique. The inspectors also reviewed resample results which were taken due to the previous lack of representative sampling.

b. Observations and Findings

On September 3, 1998, the licensee indicated that its chemical sampling of stored ice had not been representative as required by SR 3.6.11.5. Additional sampling of 12 baskets was initiated. On September 4, 1998, the licensee reported that one of the baskets exhibited a concentration of boron of 1246 parts per million (ppm) versus a requirement of 1800 ppm minimum. The licensee suspected that the sample had been contaminated with clear ice from the condensation problem. The licensee decided to conduct a statistical random sample of 55 baskets to confirm adequate boron in the Ice Condenser. The inspectors considered this to be a conservative decision. The inspectors confirmed that the average of the samples was 1921.6 ppm. Two baskets were low at 1769 ppm and

1695 ppm. The licensee's response to this problem was conservative and showed that an operability problem did not exist. However, the original surveillance conducted in accordance with 1-SI-61-1, Determination of Boron and pH on Ice Condenser Ice, Revision 1, was not in accordance with the TS regarding representative sampling. This failure constitutes a violation of minor significance and is not subject to formal enforcement action.

c. Conclusions

A minor violation was identified in that chemical sampling of the Ice Condenser was not representative, as defined by the TS. The licensee responded conservatively with resampling and showed that an operability problem did not exist.

R4 Staff Knowledge and Performance in RP&C

R4.1 Steam Generator Sample Analysis (71750)

The inspector observed performance of a steam generator sample and analysis and reviewed the following Chemistry Manual procedures: Chapter 6.10, Miscellaneous Liquid Sampling Methods, Revision 9; Chapter 11.16, Orion pH Method, Revision 3; Chapter 11.26, Boron Mettler Titration Method, Revision 6. The analyst was knowledgeable of the procedures and referenced procedures during the analysis. Sample analysis was performed in accordance with procedures. Equipment utilized by the analyst and other equipment in the chemistry lab in general were clean and in good repair.

The analyst was knowledgeable of applicable procedures and performed the sample and analysis in accordance with procedures. Laboratory equipment was clean and in good repair.

S1 Conduct of Security and Safeguards Activities

S1.1 General Comments (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 performed acceptably and barriers and zones were well-maintained.

V. Management Meetings

X1 Exit Meeting Summary

The inspectors presented the inspection results to members of licensee management at the conclusion of the inspection on September 11, 1998. Interim exits were held on August 7 and September 4, 1998. 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
L. Hartley, Maintenance Rule Coordinator
P. Hughes, Radiological Control Manager
S. Krupski, Site Scheduling Manager
D. Kulisek, Operations Manager
W. Lagergren, Plant Manager
J. Maddox, Engineering Manager
D. Nelson, Business and Work Performance Manager
P. Pace, Licensing and Industry Affairs Manager
R. Purcell, Site Vice President
S. Spencer, Site Nuclear Assurance Manager
T. Wallace, Operations Superintendent
G. Vickery, Chemistry Manager
J. West, Assistant Plant Manager

NRC

P. Van Doorn, Senior Resident Inspector
D. Rich, Resident Inspector
W. Bearden, Reactor Inspector, RII
N. Economos, Reactor Inspector, RII
W. Kleinsorge, Reactor Inspector, RII
P. Taylor, Project Engineer, RII

INSPECTION PROCEDURES USED

IP 37551:	Onsite Engineering
IP 40500:	Effectiveness of Licensee Controls in Identifying, Resolving, and Preventing Problems
IP 61726:	Surveillance Observations
IP 62700:	Maintenance Program Implementation
IP 62706:	Maintenance Rule
IP 62707:	Maintenance Observation
IP 71707:	Plant Operations
IP 71750:	Plant Support Activities
IP 92902:	Followup - Maintenance
IP 92903:	Followup - Engineering

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Closed

50-390/98-05-02	VIO	Failure to establish adequate performance criteria for SSCs Under the Maintenance Rule (Section M8.1).
50-390/98-04-03	URI	Ice Condenser Flow Passages (Section E8.1).

Discussed

50-390/98-07-01	URI	Evaluation of Ice Condenser Problems Due to Moisture in Containment (Section E8.2).

LIST OF ACRONYMS USED

ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
AUO	Assistant Unit Operator
CLA	Cold Leg Accumulator
CVCS	Chemical and Volume Control System
DBA	Design Basis Accident
DG	Diesel Generator
gal	Gallon
gpm	gallons per minute
IS-LOCA	Interfacing System Loss of Coolant Accident
IST	Inservice Testing
IC	Ice Condenser
kV	Kilovolt
LER	Licensee Event Report
MRBI	Maintenance Rule Baseline Inspection
MRC	Management Review Committee
MRPA	Maintenance Rule Periodic Assessment
NRC	Nuclear Regulatory Commission
NSSS	Nuclear Steam Supply System
NUPIC	Nuclear Procurement Issues Committee
PER	Problem Evaluation Report
PIV	Pressure Isolation Valve
ppm	parts per million
PORC	Plant Operations Review Committee
psig	pounds per square inch gauge
QA	Quality Assurance
RCS	Reactor Coolant System
RH	Relative Humidity
RHR	Residual Heat Removal
RP&C	Radiological Protection and Chemistry
SG	Steam Generator
SI	Surveillance Instruction

SR	Surveillance Requirement
SSC	Structures, Systems, and Components
SSP	Site Standard Practice
TIIC	TVA Item Identification Code
TS	Technical Specifications
URI	Unresolved Item
VIO	Violation
WO	Work Order