UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
SAM NUNN ATLANTA FEDERAL CENTER
61 FORSYTH STREET, SW, SUITE 23T85
ATLANTA, GEORGIA 30303-8931

October 29, 2007

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

SUBJECT: WATTS BAR NUCLEAR PLANT - NRC INTEGRATED INSPECTION REPORT 05000390/2007004 AND 05000391/2007004

Dear Mr. Campbell:

On September 30, 2007, the United States Nuclear Regulatory Commission (NRC) completed an inspection at your Watts Bar Nuclear Plant, Units 1 and 2. The enclosed integrated inspection report documents the inspection results which were discussed on October 5, 2007, with Mr. M. Lorek and other members of your staff.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

This report documents two NRC-identified findings of very low safety significance (Green) which were determined to involve violations of NRC requirements. However, because of their very low safety significance and because they are entered into your corrective action program, the NRC is treating these findings as non-cited violations (NCVs) consistent with Section VI.A of the NRC Enforcement Policy. If you contest any NCV in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001; with copies to the Regional Administrator, Region II; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Watts Bar facility.

In accordance with 10 Code of Federal Regulations (CFR) 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Robert L. Monk, Acting 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 05000390/2007004, 05000391/2007004
w/Attachment: Supplemental Information

cc w/encl: (See page 3)

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Letter to William R. Campbell, Jr. from Robert L. Monk dated October 29, 2007

SUBJECT: WATTS BAR NUCLEAR PLANT - NRC INTEGRATED INSPECTION REPORT 05000390/2007004 AND 05000391/2007004

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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:	05000390/2007004, 05000391/2007004
Licensee:	Tennessee Valley Authority (TVA)
Facility:	Watts Bar Nuclear Plant, Units 1 and 2
Location:	Spring City, TN 37381
Dates:	July 1, 2007 - September 30, 2007
Inspectors:	R. Monk, Senior Resident Inspector M. Pribish, Resident Inspector J. Baptist, Senior Project Engineer (Section 1R04.2, 1R07.1) A. Rogers, Reactor Inspector (Section 1R07.2) T. Nazario, Project Engineer (Section 1R06)
Approved by:	R. Monk, Acting Chief Reactor Projects Branch 6 Division of Reactor Projects

Enclosure

SUMMARY OF FINDINGS

IR 05000390/2007-004, 05000391/2007-004; 07/01/2007 - 09/30/2007; Watts Bar, Units 1 & 2; Maintenance Effectiveness and Problem Identification and Resolution.

The report covered a three-month period of routine inspection by resident inspectors, project engineers and an announced inspection by a regional reactor inspector. Two NRC-identified Green findings, which are non-cited violations (NCVs), were identified. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, Significance Determination Process (SDP). The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, Reactor Oversight Process, Revision 4, dated December 2006.

A. NRC-Identified Findings and Self-Revealing Findings

Cornerstone: Mitigating Systems

- Green. The inspectors identified a finding of very low safety significance and an associated non-cited violation of 10 CFR 50, Appendix B, Criterion XVI, Corrective Action, was identified. The licensee failed to correct, in a timely manner, a procedural deficiency associated with the setup of HFA relays. As a result, the B-train safety injection pump (SIP) was inoperable in excess of the time limits prescribed by the associated technical specification limiting condition for operation. The licensee has entered the issue into their corrective action program and revised the associated maintenance procedure.

  The finding is more than minor because it is associated with the equipment performance attribute of the Mitigating Systems cornerstone and adversely affects the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. The finding was determined to be of very low safety significance because of the duration that the B Train SIP was unavailable and the availability of the A Train SIP. The finding directly involved the cross-cutting area of Problem Identification and Resolution under the appropriate and timely corrective actions aspect of the Corrective Action Program component; in that, prior to subsequent maintenance on safety-related equipment, the licensee failed to revise a maintenance instruction that had been previously determined to be inadequate (P.1(d)). (Section 1R12)

- Green. The inspectors identified a finding of very low safety significance and an associated non-cited violation of 10 CFR 50, Appendix B, Criterion XVI, Corrective Action, was identified. The licensee failed to identify incorrect as-found nozzle ring settings on safety injection relief valves. The as-found settings were significantly incorrect as to effect the proper reseat pressure for the relief valves. The licensee has identified a long-standing condition of safety injection relief valves failing to reseat while the Safety Injection Pumps (SIPs) are running. Failure of the relief valves to reseat has required the licensee to reduce the assumed margin in the peak cladding temperature by 120° Fahrenheit. The licensee has entered the failure to identify nozzle ring configuration control into the corrective action program for resolution.

The finding is more than minor because it is associated with the equipment performance attribute of the Mitigating Systems cornerstone and adversely affects the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events and, if left uncorrected, could have a more significant impact on core peak cladding temperature. The inspectors evaluated this finding using IMC 0609, Appendix A, and determined it to be of very low safety significance (Green). The finding directly involved the cross-cutting area of Problem Identification and Resolution under the implementation and institutionalizing of Operating Experience aspect of the Operating Experience component; in that, the licensee failed to properly implement and institutionalize operating experience through changes to station procedures (P.2(b)).(Section 4OA2.3)

B. Licensee-Identified Violations

None.

REPORT DETAILS

Summary of Plant Status

Unit 1 operated at or near 100 percent power for the entire inspection period. Unit 2 remained in a suspended construction status.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R04 Equipment Alignment

.1 Partial Walkdowns

a. Inspection Scope

The inspectors performed a partial walkdown of the following three systems to verify the operability of redundant or diverse trains and components when safety equipment was inoperable. The inspectors attempted to identify any discrepancies that could impact the function of the system, and, therefore, potentially increase risk. The inspectors reviewed applicable operating procedures, walked down control systems components, and verified that selected breakers, valves, and support equipment were in the correct position to support system operation. The inspectors also verified that the licensee had properly identified and resolved equipment alignment problems that could cause initiating events or impact the capability of mitigating systems or barriers and entered them into the corrective action program. Documents reviewed are listed in the attachment.

- Auxiliary air system during the “D” station air compressor component outage
- “B” boric acid pump flowpath while the “A” boric acid pump was out of service for maintenance
- A Train emergency gas treatment system (EGTS) during the B Train EGTS component outage

b. Findings

No findings of significance were identified.

.2 Semiannual Complete System Walkdown

a. Inspection Scope

The inspectors conducted one detailed walkdown/review of the alignment and condition of the standby diesel generator system to verify proper equipment alignment and to identify any discrepancies that could impact the function of the system and increase risk. The inspectors utilized licensee procedures, as well as licensing and design documents, when verifying that the system alignment was correct. During the walkdown, the inspectors also verified, as appropriate, that: (1) valves were correctly positioned and did not exhibit leakage that would impact the function(s) of any valve; (2) electrical power was available as required; (3) major portions of the system and components were correctly labeled, cooled, ventilated, etc.; (4) hangers and supports were correctly installed and functional; (5) essential support systems were operational; (6) ancillary equipment or debris did not interfere with system performance; (7) tagging clearances were appropriate; and (8) valves were locked as required by the licensee's locked valve program. Pending design and equipment issues were reviewed to determine if the identified deficiencies significantly impacted the system's functions. Items included in this review were the operator workaround list, the temporary modification list, system health reports, and outstanding maintenance work requests/work orders (WOs). In addition, the inspectors reviewed the licensee's corrective action program (CAP) to ensure that the licensee was identifying equipment alignment problems and that they were properly addressed for resolution. Specific documents reviewed are listed in the attachment to this report.

b. Findings

No findings of significance were identified.

1R05 Fire Protection

a. Inspection Scope

The inspectors conducted a tour of the twelve areas listed below to assess the material condition and operational status of fire protection features. The inspectors verified that combustibles and ignition sources, were controlled in accordance with the licensee's administrative procedures; fire detection and suppression equipment was available for use; that passive fire barriers were maintained in good material condition; and that compensatory measures for out-of-service, degraded, or inoperable fire protection equipment were implemented in accordance with the licensee's fire plan. Documents reviewed are listed in the attachment.

- Auxiliary instrument room
- 1A-A emergency diesel generator (EDG)
- 2A-A EDG
- 1B-B EDG
- 2B-B EDG
- A Train emergency raw cooling water (ERCW) pump area
- B Train ERCW pump area
- A Train high pressure fire protection (HPFP) pump area
- B Train HPFP pump area
- A Train ERCW strainer area
- B Train ERCW strainer area
- ERCW traveling screen area

b. Findings

No findings of significance were identified.

1R06 Flood Protection Measures

.1 Internal Flooding

a. Inspection Scope

The inspectors reviewed internal flood protection measures for the intake pumping station (IPS). The inspectors walked down the IPS to observe material condition of its flooding protection features such as doors, floor drains, sump level switches, and sump pumps. The IPS flood protection features were examined to verify that they were installed and maintained consistent with plant design basis. The inspectors also reviewed selected problem evaluations reports (PERs) written during calendar year 2006 through September 2007 with respect to flood-related items. In addition, the inspectors reviewed the licensee's CAP to ensure that the licensee was identifying flood-related problems and that they were properly addressed for resolution. Documents reviewed are listed in the attachment to this report.

b. Findings

No findings of significance were identified.

.2 External Flooding

a. Inspection Scope

The inspectors reviewed licensee flood analysis documents to identify design features important to external flood protection and areas that can be affected by flooding; design flood levels; and protection features for areas containing safety-related equipment, such as level switches and sumps. The inspectors also walked down the yard drainage system to verify that catch basins were free of blockage and could function as designed. The inspectors interviewed cognizant licensee personnel about site flood protection measures and plant drainage plans. The inspectors also reviewed the licensee's CAP for documents with respect to flood-related items identified in PERs written during calendar year 2006 through September 2007. Documents reviewed are listed in the attachment.

b. Findings

No findings of significance were identified.

1R07 Heat Sink Performance

.1 Annual Review

a. Inspection Scope

The inspectors reviewed the licensee's program for maintenance and testing of two risk-important heat exchangers in the residual heat removal (RHR) system. The inspectors reviewed two heat exchangers because of the post-accident risk significance of the RHR system. Specifically, the review included the program for testing and analysis of the 1A and 1B RHR heat exchangers. The inspectors observed the physical condition of the heat exchangers and performed a review of the data obtained from periodic Eddy Current examination. This data was compared with baseline data to ensure that the licensee was adequately detecting degradation prior to loss of heat removal capabilities below design requirements, that the inspection results were appropriately categorized against pre-established engineering acceptance criteria including the impact of tubes plugged on the heat exchanger performance, and that the licensee had developed adequate acceptance criteria for bio-fouling controls. Specific documents reviewed are listed in the attachment to this report.

b. Findings

No findings of significance were identified.

.2 Biennial Review

a. Inspection Scope

The inspectors reviewed inspection records, test results, maintenance WOs, and other documentation to ensure heat exchanger deficiencies that could mask or degrade performance were identified and corrected. Risk-significant heat exchangers reviewed included the component cooling water heat exchangers along with the EDG intercooler, jacket water, and lube oil heat exchangers.

The inspectors reviewed heat exchanger inspection and cleaning completed procedures, inspection frequency, and tube plugging maps. In addition, the inspectors reviewed Eddy Current test reports for the EDG intercooler heat exchanger. The inspectors reviewed to determine that: (1) selected heat exchanger test methodology was consistent with NRC Generic Letter 89-13, Service Water System Problems Affecting Safety-Related Equipment, commitments; (2) test conditions were appropriately considered; (3) test or inspection criteria were appropriate and met; (4) test frequency was appropriate; (5) as-found results were appropriately dispositioned such that the final condition was acceptable; and (6) test results considered test instrument inaccuracies and differences.

The inspectors also reviewed the general health of the ERCW system via review of design basis documents, system health reports, and discussions with the ERCW system engineer. These documents were reviewed to verify the design basis was being maintained and to verify adequate ERCW system performance under current preventive maintenance, inspections, and frequencies. The inspectors also walked down the ERCW intake structure and observed a chemical treatment to the ERCW backup to the auxiliary feedwater (AFW) system.

PERs were reviewed for potential common-cause problems and problems which could affect system performance, to confirm that the licensee was entering problems into the CAP and initiating appropriate corrective actions. In addition, the inspectors conducted a walkdown of all selected heat exchangers and major components for the ERCW system to assess general material condition and to identify any degraded conditions of selected components. Specific documents reviewed are listed in the attachment to this report.

b. Findings

No findings of significance were identified.

1R11 Licensed Operator Requalification

a. Inspection Scope

On July 31, 2007, the inspectors observed the as-found simulator evaluations for Group 1 per 3-OT-SRT-E2-3, Main Steam Line Break Design Basis, Revision 2. The rapid reactor coolant system (RCS) cooldown and safety injection initiation led to a Notification of Unusual Event emergency action level classification.

The inspectors specifically evaluated the following attributes related to the operating crew performance:

- Clarity and formality of communication
- Ability to take timely action to safely control the unit
- Prioritization, interpretation, and verification of alarms
- Correct use and implementation of abnormal operating instructions and emergency operating instructions
- Timely and appropriate emergency action level declarations per emergency plan implementing procedures
- Control board operation and manipulation, including high-risk operator actions
- Command and control provided by the unit supervisor and shift manager

The inspectors also attended the post-evolution critique to assess the effectiveness of the licensee evaluators and to verify that licensee-identified issues were comparable to issues identified by the inspector.

b. Findings

No findings of significance were identified.

1R12 Maintenance Effectiveness

a. Inspection Scope

The inspectors reviewed the two samples listed below for items such as: (1) appropriate work practices; (2) identifying and addressing common cause failures; (3) scoping in accordance with 10 CFR 50.65(b) of the maintenance rule (MR); (4) characterizing reliability issues for performance; (5) trending key parameters for condition monitoring; (6) charging unavailability for performance; (7) classification and reclassification in accordance with 10 CFR 50.65(a)(1) or (a)(2); and (8) appropriateness of performance criteria for structures, systems, and components (SSCs)/functions classified as (a)(2) and/or appropriateness and adequacy of goals and corrective actions for SSCs/functions classified as (a)(1). In addition, the inspectors specifically reviewed events where ineffective equipment maintenance has resulted in invalid automatic actuations of Engineered Safeguards Systems affecting the operating units. Documents reviewed are listed in the Attachment. Items reviewed included the following:

- PER 126359, Repetitive Failures of Shutdown Board Room Chiller Temperature Control Valves
- PER 125404, 1B Safety Injection Pump Failed to Start

b. Findings

Introduction: The inspectors identified a Green NCV for the failure to comply with 10 CFR 50, Appendix B, Criterion XVI, Corrective Action, which resulted in the failure of the 1B SIP to start on demand.

Description: On September 22, 2006, the 1B-B 6.9 kV shutdown board normal feeder breaker failed its post-maintenance test (PMT) due to the 30RX latching relay in the breaker's control circuit. The relay had just been replaced due to an ongoing effort to replace aging relays. Prior to replacing the relay, licensee procedure Maintenance Instruction (MI) 57.029, HFA Relay Maintenance, was used to test the relay's latching mechanism, as well as, to make any necessary adjustments to the relay's contact gap and wipe. Troubleshooting revealed that the relay's normally open contact 1-2 was not closing when the relay was electrically operated to the latched position. The licensee entered the condition into their CAP as PER 111386, and determined that MI-57.029 should have identified the problem prior to installation. The licensee determined a revision to MI-57.029 was needed so the problem would not recur. The planned procedure revision would add an electrical bench test of the relay with closed contact resistance measurements to verify contact continuity with the relay in the latched position. The original due date for the procedure revision was June 4, 2007, but was later extended to August 6, 2007.

On May 26, 2007, when called upon to fill a cold leg accumulator, the 1B SIP failed to start because its associated 6.9 kV supply breaker failed to shut. Troubleshooting revealed that the breaker failed to shut due to the 30RX latching relay in the breaker's control circuit. The relay's normally open contact 9-10 had intermittent electrical continuity when the relay was in the latched position. The inspectors performed a work history search which revealed that the relay had been replaced as part of a planned component outage on the 1B SIP on March 6, 2007. Prior to installation, the 1B SIP 30RX relay was set up and tested using the same revision of MI-57.029 that was associated with the September 2006 PMT failure. In addition, the inspector's review of the completed MI-57.029 paperwork for the 1B SIP revealed that a procedural step to clean the relay contacts with a flexible burnishing tool had been inappropriately marked "N/A." A review of the 1B SIP operating history revealed that between the relay replacement on March 3, 2007, and the failure on May 26, 2007, the pump did have one successful start on April 27, 2007.

Through discussions with the licensee, the inspectors determined that the September 2006 and May 2007 relay failures were not identical. The September 2006 failure was due to latch mechanism interference. The May 2007 failure was due to poor contact electrical continuity. The inspectors also determined that the prompt implementation of the planned procedure revision to MI-57.029 could have prevented the May 2007 failure since the revision would direct verification of proper contact continuity with the relay in the latched state.

Analysis: The finding is more than minor because it is associated with the equipment performance attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events. The inspectors evaluated this finding using IMC 0609, Appendix A, and determined that a Phase 2 of the significance determination process (SDP) was required since the finding represented an actual loss of safety function of a single train for greater than its technical specification allowed outage time. The results of the Phase 2 SDP required further evaluation by a regional Senior Reactor Analyst (SRA). A Phase 3 SDP risk analysis was performed for the non-recoverable loss of the 1B safety injection pump for an exposure period of 14.5 days using the NRC's risk model for Watts Bar. The evaluation determined that the risk increase was Green, less than 1E-6 /year. The factors which influenced the risk were the short exposure time and the availability of additional mitigating equipment. The finding directly involved the cross-cutting area of Problem Identification and Resolution under the appropriate and timely corrective actions aspect of the Corrective Action Program component; in that, prior to subsequent maintenance on safety-related equipment, the licensee failed to revise a maintenance instruction that had been previously determined to be inadequate (P.1(d)).

Enforcement: 10 CFR 50 Appendix B, Criterion XVI, Corrective Action, states, in part, that measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, defective material and equipment, and non-conformances are promptly identified and corrected. Contrary to the above, the 1B SIP 30RX latching relay was replaced on March 6, 2007, using a maintenance instruction that had previously been determined to be inadequate. The procedural condition was not corrected until July 27, 2007. Because this finding is of very low safety significance and because it was entered into the licensee's CAP as PERs 111368, 125404 and 131704, this violation is being treated as an NCV, consistent with

Section VI.A of the NRC Enforcement Policy: NCV 05000390/2007004-01, Failure to Promptly Correct an Identified Procedural Deficiency Prior to Subsequent Maintenance.

1R13 Maintenance Risk Assessments and Emergent Work Evaluation

a. Inspection Scope

The inspectors evaluated, as appropriate for the four work activities listed below: (1) the effectiveness of the risk assessments performed before maintenance activities were conducted; (2) the management of risk; (3) that, upon identification of an unforseen situation, necessary steps were taken to plan and control the resulting emergent work activities; and (4) that maintenance risk assessments and emergent work problems were adequately identified and resolved. The inspectors verified that the licensee was complying with the requirements of 10 CFR 50.65 (a)(4); SPP-7.0, Work Control and Outage Management; SPP-7.1, Work Control Process; and TI-124, Equipment to Plant Risk Matrix.

- Emergent work on the failed refueling water storage tank (RWST) transmitter, Channel I
- Emergent work on the B Train electric boardroom chiller with B Train main control room chiller degraded and functional testing of B Train solid state protection system
- Maintenance risk associated with the B Train shutdown boardroom chiller component outage
- Emergent work on B Train rod position indication system with the redundant train out of service

b. Findings

No findings of significance were identified.

1R15 Operability Evaluations

a. Inspection Scope

The inspectors reviewed four operability evaluations affecting risk-significant mitigating systems, listed below, to assess, as appropriate: (1) the technical adequacy of the evaluations; (2) whether continued system operability was warranted; (3) whether other existing degraded conditions were considered as compensating measures; (4) whether the compensatory measures, if involved, were in place, would work as intended, and were appropriately controlled; (5) where continued operability was considered unjustified, the impact on TS Limiting Conditions for Operation (LCOs) and the risk significance in accordance with the SDP. The inspectors verified that the operability evaluations were performed in accordance with SPP-3.1, Corrective Action Program.

- PER 124435, Component cooling system heat exchange overall heat transfer coefficient
- PER 127222, B-A ERCW pump motor winding high temperature alarm
- PER 100385, One of four 1B-B DG inlet air dampers failed to open
- PER 125669, Safety injection pump discharge relief valve(s) lifting and remaining open during pump operation

b. Findings

No findings of significance were identified.

1R19 Post-Maintenance Testing

a. Inspection Scope

The inspectors reviewed five post-maintenance test (PMT) procedures and/or test activities, as appropriate, for selected risk-significant mitigating systems to assess whether: (1) the effect of testing on the plant had been adequately addressed by control room and/or engineering personnel; (2) testing was adequate for the maintenance performed; (3) acceptance criteria were clear and adequately demonstrated operational readiness consistent with design and licensing basis documents; (4) test instrumentation had current calibrations, range, and accuracy consistent with the application; (5) tests were performed as written with applicable prerequisites satisfied; (6) jumpers installed or leads lifted were properly controlled; (7) test equipment was removed following testing; and (8) equipment was returned to the status required to perform its safety function. The inspectors verified that these activities were performed in accordance with SPP-8.0, Testing Programs; SPP-6.3, Pre-/Post-Maintenance Testing; and SPP-7.1, Work Control Process.

- WO 07-815133-000, A Train SDBR chiller temperature control valve will not control in auto
- WO 07-818889-000, RWST level, Channel I transmitter replacement
- WO 07-817168-000, CCS and AFW pump space cooler 1B ERCW supply valve troubleshoot and repair
- WOs 06-821498-000 and 06-821507-000, Containment purge isolation valve quick exhausters 1-EXH-030-0057 and 1-EXH-030-001
- WO 07-816670-001, Install tornado bypass hand switch for the 1A-A EDG exhaust fan 2A

b. Findings

No findings of significance were identified.

1R22 Surveillance Testing

a. Inspection Scope

The inspectors witnessed six surveillance tests and/or reviewed test data of selected risk-significant structures, systems or components (SSCs), listed below, to assess, as appropriate, whether: (1) the SSCs met the requirements of the TS; (2) the UFSAR; (3) SPP-8.0, Testing Programs; (4) SPP-8.2, Surveillance Test Program; and (5) SPP-9.1, ASME Section XI. The inspectors also determined whether the testing effectively demonstrated that the SSCs were operationally ready and capable of performing their intended safety functions.

- WO 07-813472-000, 1-SI-63-901A, Safety Injection Pump 1A-A Quarterly Performance Test*
- WO 06-820597-000, 1-SI-90-14, 18-month Channel Calibration Test of Containment Building Lower Compartment Particulate Rad Monitor Loop 1-LPR-90-106A**
- WO 07-812992-000, 1-SI-99-10-A, 31-day Functional Test of SSPS A Train and Reactor Trip Breaker A
- WO 07-813096-000, 0-SI-236-43, 125 Vdc Vital Battery III 18-month Service Test and 125 Vdc Vital Battery Charger III Test
- WO 07-813652-000, 1-SI-63-901B, Safety Injection Pump 1B-B Quarterly Performance Test*
- WO 813595-000, 1-SI-3-902, Turbine-driven AFW Pump Quarterly Performance Test*

*This procedure included inservice testing requirements.
**This procedure included reactor coolant system leakage detection testing requirements.

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES

4OA1 Performance Indicator (PI) Verifications

a. Inspection Scope

Licensee records were reviewed to determine whether the submitted PI statistics were calculated in accordance with the guidance contained in Nuclear Energy Institute 99-02, Regulatory Assessment Performance Indicator Guideline, Revision 4.

Mitigating Systems Cornerstone

The inspectors verified the accuracy of the data for the five mitigating system performance indicators (MSPIs), listed below, which was reported to the NRC. The inspectors reviewed data from July 1, 2006, through June 30, 2007. The inspectors reviewed the licensee's MSPI basis document, main control room operator logs, corrective action program documents, maintenance rule records, maintenance work orders and operability determinations.

- MSPI - Emergency AC Power System
- MSPI - High Pressure Injection System
- MSPI - Heat Removal System
- MSPI - Residual Heat Removal System
- MSPI - Cooling Water Systems

b. Findings

No findings of significance were identified.

4OA2 Identification and Resolution of Problems

.1 Review of Items Entered into the Corrective Action Program

As required by Inspection Procedure 71152, Identification and Resolution of Problems, and in order to help identify repetitive equipment failures or specific human performance issues for follow-up, the inspectors performed a daily screening of items entered into the licensee's corrective action program (CAP). This review was accomplished by reviewing daily PER summary reports and attending daily PER review meetings.

.2 Annual Sample Review of Operator Workarounds

a. Inspection Scope

The inspectors reviewed the operator workaround program to verify that workarounds were identified at an appropriate threshold, were entered into the corrective action program, and that corrective actions were proposed or implemented. Specifically, the inspectors reviewed the licensee's workaround list and repair schedules, conducted tours and interviewed operators about required compensatory actions. Additionally, the inspectors looked for undocumented workarounds, reviewed appropriate system health documents, and reviewed PERs related to items on the workaround list.

b. Findings and Observations

No findings of significance were identified.

.3 Annual Sample: Failure of Safety Injection Relief Valves to Reseat After Actuation

a. Inspection Scope

The inspectors reviewed a longstanding equipment issue associated with the lifting of relief valve(s) in the safety injection system during SIP operation. Several related PERs, corrective action documents, and causal analyses were reviewed in detail to ensure that the full extent of the described issues were identified, thorough evaluations were performed, and appropriate corrective actions were specified, prioritized, and completed. The inspectors also evaluated licensee actions against the requirements of the licensee's corrective action program as specified in SPP-3.1, Corrective Action Program, and 10 CFR 50, Appendix B .

Background

PER 85969 was written on July 17, 2005, in response to one or more of the three discharge relief valves lifting and not reseating when 1A SIP was started for a routine surveillance test. The relief valve(s) continued to relieve until the 1A SIP was secured. Flow from the relief valves, which are outside containment, is piped to the pressure relief tank (PRT) inside containment. On this particular event, the flowrate was determined to be approximately 23 gpm based on a change in PRT level. The root cause analysis (Kepner-Tregoe methodology) determined that the most likely cause was relief valve setpoint drift. It is noteworthy that setpoint drift, due to overtravel of the valve on pressure spikes, had been determined to be the apparent cause in a previous PER 13915, dated July 22, 2001, resulting in a 30 gpm leakrate to the PRT. The principle corrective action for that PER was to replace the stainless steel valve springs with inconel valve springs and a travel stop limit.

In September 2006, the valves associated with PER 85959 were removed and tested to determine their lift pressure. The as-found testing of the removed relief valves did not indicate a drift problem. Following the determination that setpoint drift was not the root cause, gas voids in the system were elevated to the most likely cause. Corrective actions associated with this cause include ultrasonic measurements to detect voids in the system and an engineering study by MPR Associates, Inc. The engineering study determined that 1.2 to 3.0 cubic feet of gas in the system could cause a pressure transient on safety injection pump starts that would exceed normal relief valve set pressure. Ultrasonic measurements, performed by the licensee, have found 0.32 cubic feet of gas in the system and the licensee has speculated that more could exist. Based on the belief that there is sufficient gas in the system to cause the reliefs to lift, a design change is planned for the upcoming outage in the Spring of 2008 to install additional system vents.

b. Assessment and Observations

Corrective actions to this point have focused on relief valve setpoint. Based on interviews with plant personnel, inspectors have found no efforts focused on the reason(s) that the reliefs frequently fail to reseat. Significant industry operating experience and generic communications from both the NRC (IN 92-64) and the industry exist on the importance of these settings. An extensive review of maintenance WOs revealed that, on at least five occasions, nozzle ring as-found settings were incorrect. Two were insignificantly incorrect such that the reseating would not likely have been affected. However, three were significantly incorrect to the point of affecting reseat pressure. No PERs could be found documenting this condition. The licensee has now written PER 130590 to investigate configuration control issues related to nozzle ring settings for these valves.

Also related to relief valve failure to reseat with the SIPs running is that the flow that should go to the reactor core is being bypassed to the PRT. The licensee has recognized this problem and has, by analysis, determined that a bounding flowrate of 30 gpm would penalize peak cladding temperature by 120°F. The licensee made notification to the NRC pursuant to 10 CFR 50.46. The assumption is that one valve would not leak more than what has been observed. However, the licensee has never determined specifically which valve or valves fail to reseat. Neither does the licensee have any trending data on pressure transients due to pump starts that would allow any correlation with measurements of gas voids taken by ultrasonic measurements. Hence, there is some degree of speculation that gas voids are the root cause of the spurious relief valve lifts.

It is apparent in the review of corrective action efforts dating back to 1995 that the licensee has expended a great deal of effort resolving this issue. However, it is also apparent that these efforts have been somewhat sporadic and lacked a clear plan that systematically collected, trended, and analyzed available data to resolve the issue. Documents reviewed are listed in the attachment.

c. Findings

Introduction: The inspectors identified a Green NCV of 10 CFR 50, Appendix B, Criterion XVI, Corrective Action, regarding the failure of safety injection relief valves to reseat as required.

Discussion: Review of the performance of the safety injection relief valves indicates a long-standing issue of failing to reseat after safety injection pump starts. This issue dates back to 1995 and has continued to intermittently occur to the present time. A number of corrective actions have been performed by the licensee without success. The maintenance history of these valves indicates that, on at least three occasions, the as-found settings of the relief valve nozzle rings were significantly out of tolerance. These settings are critical to the proper reseating of the relief valve as evidenced by numerous industry events related to improper nozzle ring settings. The licensee has documented the data in the appropriate maintenance procedures but failed to identify the out-of-tolerance condition as a condition adverse to quality. Hence, no actions have been taken to determine and correct configuration control of these settings.

Analysis: The finding is more than minor because it is associated with the equipment performance attribute of the Mitigating Systems cornerstone and adversely affects the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events and, if left uncorrected, could have a more significant impact on core peak cladding temperature. The inspectors evaluated this finding using IMC 0609, Appendix A, and determined it to be of very low safety significance (Green). The finding directly involved the cross-cutting area of Problem Identification and Resolution under the implementation and institutionalizing of Operating Experience aspect of the Operating Experience component; in that, the licensee failed to properly implement and institutionalize operating experience through changes to station procedures (P.2(b)).

Enforcement: 10 CFR 50 Appendix B, Criterion XVI, Corrective Action, states, in part, that measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, defective material and equipment and non-conformances are promptly identified and corrected. Contrary to the above, the licensee failed to enter a number of occurrences into the CAP where configuration control of the nozzle rings was not maintained. Because this finding is of very low safety significance and because it was entered into the licensee's CAP as PER 130590, this violation is being treated as an NCV, consistent with Section VI.A of the NRC Enforcement Policy: NCV 05000390/2007004-02, Failure to Promptly Correct the Failure of Safety Injection Relief Valves to Reseat after Actuation.

4OA6 Meetings, including Exit

The inspectors presented the inspection results to Mr. M. Lorek and other members of licensee management at the conclusion of the inspection on October 5, 2007. The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee personnel

J. Hinman, Manager of Projects
A. Hinson, Site Engineering Manager
M. Lorek, Plant Manager
K. Lovell, Maintenance and Modifications Manager
M. McFadden, Site Nuclear Assurance Manager
P. Sawyer, Radiation Protection Manager
A. Scales, Operations Manager
M. Skaggs, Site Vice President
J. Smith, Licensing and Industry Affairs Manager
S. Smith, Operations Superintendent
W. Thompson, Training Manager

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Opened and Closed

050000390/2007004-01	NCV	Failure to Promptly Correct an Identified Procedural Deficiency Prior to Subsequent Maintenance (Section 1R12)
05000390/2007004-02	NCV	Failure to Promptly Correct the Failure of Safety Injection Relief Valves to Reseat after Actuation (Section 4OA2.3)

Closed

None

Discussed

None

LIST OF DOCUMENTS REVIEWED

Section 1R04: Equipment Alignment

- TVAN System Description Document N3-82-4002, Standby Diesel Generator System
- 0-SI-82-17-A, 184 Day Fast Start and Load Test DG 1A-A Rev. 13 dated 8/28/07
- 0-SI-82-17-A, 184 Day Fast Start and Load Test DG 1A-A Rev. 12 dated 4/09/07
- TVA Drawing Series 1-47W839
- TVA Drawing Series 1-47W880
- TVA Drawing Series 1-47W881
- DCN 52233, EDG exhaust fan bypass switch
- WO 07-816670-000
- PER 120005, Diesel building ventilation during tornado warning
- PER 124355, Diesel generator 1B heat exchanger thermal performance testing
- PER 127383, DG transmitter gasket
- SOI-62.05, Boric Acid Batching, Transfer, and Storage, Rev 38
- TVA Drawing 47W610-62-6
- TVA Drawing 47W610-65-1

Section 1R05: Fire Protection

- SPP-10.0, Control of Fire Protection Impairments
- SPP-10.10, Control of Transient Combustibles
- SPP-10.11, Control of Ignition Sources (Hot Work)

Section 1R06: Flood Protection Measures

- Updated Final Safety Analysis Report (UFSAR) Sections 2.4.14, 3.4
- Abnormal Operating Instruction (AOI)-7.01, Maximum Probable Flood, Revision 16
- Individual Plant Examination, Watts Bar Internal Flood Analysis Section E.1.5.2.1, Intake Pumping Station, Revision 0
- Individual Plant Examination for External Events - High Winds, Floods, and other External Events, Attachment 5 Section 5.6
- WB-DC-20-28, Intake Pumping Station Watertight Doors at Elevation 722.0, Revision 4
- WB-DC-20-31, Plant Drainage, Revision 3
- WB-DC-40-64, Design Basis Events Design Criteria, Section 4.4-Design Basis Flood, Revision 11
- WB-DC-20-19, Intake Pumping Station Concrete Structure, Intake Channel, and Retaining Walls, Revision 11
- Maintenance Instruction (MI)-17.033, Flood Preparation-Install Blind Flanges on HPFP Discharge Relief Valves, Revision 6
- WB-DC-40-29, Flood Protection Provisions, Section 4.11 and Table 4.1-2, Revision 9
- Technical Instruction (TI)-50.021, Intake Pumping Station Strainer Room A Sump Pump A Performance Test, Revision 3
- Technical Instruction (TI)-50.021, Intake Pumping Station Strainer Room A Sump Pump B Performance Test, Revision 4
- Problem Evaluation Report (PER) 126535, B Train High Pressure Fire Pump Room at the Intake Pumping Station was found flooded

- PER 119345, While performing a walkdown of the flood mode spool pieces, Operations discovered the rigging in the spool piece tool boxes had expired
- PER 102356, PER to track the station drainage system improvement plan developed
- PER 128435, IPS Strainer Room A Sump Pump Test Failure

Section 1R07: Heat Sink Performance

- Eddy Current Examination Report WBN-1-14, Residual Heat Removal Heat Exchangers A & B - Baseline report
- Eddy Current Examination Report WBN-1-44, Residual Heat Removal Heat Exchanger 1A
- Eddy Current Examination Report WBN-2-4, Residual Heat Removal Heat Exchanger 2B
- WBN Letter PA-427 dated December 17, 1984
- TVAN System Description Document N3-74-4001, Residual Heat Removal System
- TVAN System Description Document N3-63-4001, Safety Injection System
- WO 97-001967-000
- WO 98-002459-000
- WO 06-820778-000
- RHR 2007 System Health Report
- TI-79.00, Revision 4, generic Letter 89-13 Heat Exchanger Test Program
- Eddy Current Examination Report, November 2000, Component Cooler B
- Eddy Current Examination Report, Februaury 2005, Component Cooler A
- Eddy Current Examination Report, September 2003, Component Cooler C
- Eddy Current Examination Report, spring 2006, emergency Diesel Generator 1A1, 1A2, 1B1 - 2A1, 2A2. 2B1, 2B2
- ERCW System Health Report, FY 2007- P2
- Component Cooling Water System Health Report, FY 2007- P2
- PER 124588, Execution of TI-67.005 unsatisfactory
- PER 97904, connecting 6 inch head that feed into MDAFW 40% blocked
- PER 97663, B Train ERCW supply line to TDAFW ppump not properly vented

Section 1R12: Maintenance Effectiveness

- TI-119, Maintenance Rule Performance Indicator Monitoring, Trending, and Reporting 10 CFR 50.65
- SPP-6.6, Maintenance Rule Performance Indicator Monitoring, Trending, and Reporting 10 CFR 50.65
- GE Service Information Letter, SIL No. 44, Supplement 5, Category 1
- GE Service Information Letter, SIL No. 44, Supplement 4, Revision 2, Category 1
- GE Service Information Letter, SIL No. 44, Supplement 4, Category 1
- NRC Bulletin 88-03, Inadequate Latch Engagement I HFA Type Latching Relays Manufactured by General Electric (GE) Company

Section 4OA2: Identification & Resolution of Problems

PER 13915 dated 7/22/01
PER 6052 dated 10/24/02
PER 6455 dated 01/02/03
PER 85969 dated 07/17/2005
PER 124658 dated 05/11/2007
PER 130590 dated 09/19/2007
Crosby Valve test reports for relief valves N56886-00-0010, N56886-00-0009, N56886-00-0001
Crosby Instruction Manual WBN-VTD-C710-0130
MI-0.011 Safety/Relief Valve Maintenance Instruction
MPR Associates, Inc. Hydraulic Transient Analysis

WO 95-019695-000
WO 99-006284-000
WO 01-012645-000
WO 01-013502-000
WO 01-013503-000
WO 02-003785-000
WO 03-003067-000
WO 03-003068-000
WO 03-003069-000
WO 03-003070-000
WO 04-813845-000
WO 05-813873-000
WO 05-817979-005
WO 05-818123-000
WO 05-818123-001
WO 05-818123-002
WO 05-818123-004
WO 05-818123-005