



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W., SUITE 2900
ATLANTA, GEORGIA 30323-0199

Report Nos.: 50-390/93-71 and 50-391/93-71

Licensee: Tennessee Valley Authority
3B Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Docket Nos.: 50-390 and 50-391

License Nos.: CPPR-91 and CPPR-92

Facility Name: Watts Bar 1 and 2

Inspection Conducted: September 1 - 30, 1993

Inspector: N. Merriweather
N. Merriweather

10/15/93
Date Signed

Other NRC Inspectors: P. Taylor

NRC Contractors: J. Agles
R. Gilbert
Beckman and Associates

Approved by: Candice A. Julian
C. Julian, Chief
Engineering Branch
Division of Reactor Safety

10/27/93
Date Signed

SUMMARY

Scope:

This routine, announced inspection was conducted in the areas of preoperational test results package review, preoperational test instruction review and preoperational test witnessing.

Results:

Definitions of acronyms and abbreviations used in this report are contained in the last paragraph of the report.

In the areas inspected one violation, four inspector followup items and two weaknesses were identified. The evaluation of these activities is summarized as follows:

Violation

The licensee's Startup Manual Procedure SMP 9.0, Test Conduct provided specific requirements on the contents of test packages. This procedure required the Master Tracking System (MTS) Exception Forms and test authorization packages to be included in the test package. Contrary to the above, neither the MTS Exception Forms nor the test authorization package were included in the test result records for Preoperational Test Instruction (PTI) 232-01, Revision 0, 480V Reactor Vent Boards, approved by the JTG on June 29, 1993. This was cited as a violation (50-390/93-71-01) of 10 CFR 50, Appendix B, Criterion V for failure to maintain test result records in accordance with Startup procedures.

IFIs

Two inspector followup items (50-390/93-71-02 and -03) were identified on the licensee's procedure upgrade program in two areas of concern: 1) clarifying the Level III review and sign-off for test deficiency notices that require troubleshooting and 2) developing additional guidance to clarify how revisions or change notices should be incorporated into pre-operational test instructions. The licensee agreed to examine these concerns as part of the overall review of Startup procedures.

The third IFI was identified to followup on the corrective action for NRC comments resulting from the review of PTI-063-01, Safety Injection System (SIS) Integrated Test. PTI-063-01 had numerous technical and administrative problems similar to those found in PTI 63-02 and -03 which were cited as examples of a violation in NRC Inspection Report 50-390,391/93-61. The licensee's response to the violation was still pending. The licensee stated that the deficiencies identified for PTI-063-01 will be addressed in their response to the notice of violation identified in NRC Inspection Reports 50-390,391/93-53 and 93-61. This issue will be tracked as IFI 50-390/93-71-04 to verify that the corrective action plan for violations cited in NRC Inspection Reports 50-390/93-53 and 93-61 is also applied to PTI-063-01 and that Revision 1 of PTI-063-01 adequately resolves NRC comments identified in this report.

The fourth and final IFI (50-390/93-71-05) was identified to track a potential vibration problem observed by the inspector during testing on SIS Accumulator No. 1 fill piping and to review the design basis for the differences in as-built configuration between Accumulator No. 1 fill piping and geometrically similar piping on Accumulator No. 3. The Accumulator No. 3 piping was noted by the inspector to have more supports than the Accumulator No.1 piping.

Weaknesses

The inputs to monitor SIS Accumulator isolation valve position were erroneously disconnected from the strip chart recorder during the low pressure blowdown test. In addition an equalizing valve was left open on a low pressure dp cell. As a result of these two problems the blowdown test had to be repeated. The inspector concluded from witnessing the

test that two possible causes for these test conduct problems were a lack of attention to detail and a failure to provide sufficient information in the pretest briefing on data needed to be recorded.

The inspector identified during the review of PTI-232-01 test results that several log entries were not discrete in time and did not provide a sequence of events. The log entries in most cases were narrative summaries of a conglomeration of multiple events occurring over a time span of several hours. This failure to maintain the sequence of events in the chronological test log was identified as a weakness. The licensee agreed with this comment and indicated that additional guidance will be provided to test directors on maintenance of the chronological test log.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

- *M. Alexander, Site Representative CRS
- *S. Anthony, Licensing Engineer
 - J. Ballowe, Startup Programs Manager
 - M. Bellamy, Startup Manager
- *K. Boyd, Program Administrator, TVA Site Licensing
- *J. Christensen, Site Quality Manager
- *S. Crowe, QA Manager
- *R. Daly, Startup Manager
 - C. Dumsday, Nuclear Steam Supply System Test Manager
- *W. Elliott, Engineering and Modifications Manager
- *M. Fecht, Operations QA Manager
 - D. Johnson, Startup Engineer
- *N. Kazanas, Vice President Completion Assurance
- *D. Koehl, Technical Support Manager/JTG Chairman
 - F. Koontz, Operations Engineering Manager
- *W. Museler, Site Vice President
 - G. Ondriska, Startup
 - T. Overlit, Mechanical Supervisor, Nuclear Engineering
- *P. Pace, Compliance Licensing Manager
 - G. Pannell, Site Licensing Manager
 - T. Porter, Licensing Manager
 - R. Purcell, Startup Test Manager
 - J. Robertson, Nuclear Engineer
 - F. Stultz, NSSS Startup Engineer
- *C. Touchstone, Licensing Engineer

Other licensee employees contacted during this inspection included craftsmen, operators and administrative personnel.

NRC Personnel

- *J. Agles, Contractor
- *R. Gilbert, Contractor
- *W. Marini, Contractor
- *D. Myers, Contractor
- *G. Walton, Senior Resident Inspector

*Attended Exit Meeting

2. Preoperational Test Results Package Review (70455B)

- a. PTI-212-01, 480V Shutdown Power Unit 1 "A" Train, revision 0.

The objective of PTI-212-01 was to verify operability and performance of 480V Shutdown Power Boards 1A1-A and 1A2-A and to demonstrate the ability of the system to perform under conditions as close to design as possible.

Completed and vaulted test procedure PTI-212-01 was reviewed with the objective of determining if it represented a clear record of test performance, test deficiencies generated and actions taken to resolve and correct these test deficiencies. In general the inspector found that this vaulted procedure was a sufficiently complete QA record to permit accomplishment of this objective.

One area of concern was noted by the inspector. This involved test deficiencies that required significant troubleshooting to establish the cause of the deficiency. In cases where accomplishment of the troubleshooting takes more than a few days, it appears that the potential exists for important elements of the test deficiency review process to be bypassed. The concern is best illustrated as follows:

- Test Objective 1.5 for this PTI stated "VERIFY tripping devices, targets and interlocks for the Unit 1 "A" Train 480V Shutdown Boards and associated 6900V feeder breakers function properly." DN's 07 and 08 documented two instances where the local targets for the undervoltage relays on the 3200 amp section of the 480V shutdown boards failed to operate following relay actuation. These DN's were dispositioned for the Customer Group to troubleshoot and repair as necessary. The Customer Group found that the relays were not deficient but that there was insufficient current in the dc control circuit to actuate the targets due to insufficient resistance in the circuit, i.e., a design deficiency was uncovered by the startup program. This problem was documented on a QDCN (24772-A) to provide the vehicle for Engineering to resolve the problem.

Concern with the sequence described above involved the review of test deficiencies for reportability, need for a SCAR and generic implications. To accomplish this, SMP 9.0 Section 2.6 requires a Level III review of DN's within 3 days of initiation. For DN's 07 and 08 the Level III review was performed on the same day as the test director initiated the DN's, i.e., prior to it being discovered that a deficiency in design existed. Since SMP 9.0 does not require the Level III review to be reperfomed after troubleshooting is complete, the deficiency in design discovered by the troubleshooting for DN's 07 and 08, did not get a documented review for the issues required by SMP 9.0 Section 2.6. As a result it is not clear that the licensee has considered the possibility that this design deficiency may apply to relays other than those on the 3200 amp section of the 480V Shutdown Boards.

The licensee has agreed to review this issue to determine the need to reperform and document the Level III DN review following completion of troubleshooting or issue a new DN describing the full scope of the problem. Completion of the licensee's review will be tracked as IFI 390/93-71-02.

b. PTI-232-01, 480V Reactor Vent Boards, Revision 0

The objective of PTI-232-01 was to verify the operability and performance of 480V reactor vent boards and to demonstrate the ability of the system to perform under conditions as close to design as possible.

The inspector reviewed a copy of the vaulted test results package for PTI-232-01 to evaluate the adequacy of the test data, the administrative practices with respect to test execution, test changes and test records and to verify that deviations were properly dispositioned.

The inspector determined that the test results package was incomplete and noted weaknesses as follows:

- Startup Manual Procedure (SMP) 9.0, Test Conduct, Revision 16 dated June 21, 1993, Section 2.2, Pre-Authorization Test Activities, and Section 3.1, Quality Assurance (QA) Records identify the following requirements:

SMP-9.0, Section 2.2, paragraph 2.2.H states, Attach the authorization package presented to JTG to the test package.

SMP-9.0, Section 3.1, states, When the test is a QA record or In-Process QA record, the Chronological Test Log, Test Deficiencies, and MTS Exception Form (as applicable) are considered QA records and are stored as part of the test results package.

It was found that neither the authorization package presented to the JTG nor the MTS Exception Form(s) were a part of approved test results package for PTI-232-01, Revision 0, approved on June 29, 1993. After identification of this deficiency by the inspector, the licensee initiated Problem Evaluation Report (PER) WBPER930317 to address the problem. This has been identified as Violation 50-390/93-71-01.

- Procedure change notice Number CN-01 was implemented to add the following objective as substep 1.1.1.H: the test does not verify setpoint of bus undervoltage time delay relays but demonstrates function only.

SMP-8.0, Administration of Preoperational Test Procedures, Revision 11, Step 2.6.K states that TE/TD will incorporate change notices in the test procedure. No specific guidance with respect to how to incorporate the change notice is provided.

Change Notice CN-01 was incorporated by removing original page 4 of the Official Test Copy of the procedure, retyping the entire page adding Step 1.1.1.H and inserting the new Page 4 in the Official Test Copy. A revision bar was placed along the entire length of the page.

In this case, the removal of an Official Test Copy page from the package had no adverse impact on the technical content of the package. This may not always be the case. The lack of page accountability for Official Test Copy pages and lack of guidance with respect to incorporation of change notices were identified by the inspector as a concern. The licensee stated that additional direction with respect to incorporation of change notices and page accountability will be addressed as a part of the startup corrective action plan. Completion of this action by the licensee will be tracked as IFI 390/93-71-03.

- The chronological test log for the procedure was written in the form of a narrative. Single log entries were made to document several actions. The actions that were documented in these entries occurred over time spans of hours. An example is the log entry at 13:20 hours on June 11, 1993 which stated the following:

"Received SOS permission to start section and began testing. Completed section 6.1 thru step 6.1.45. Initiated CN-02 after determining that procedure did not include step to restore 43TG Logic Panel Switch to NCR position. Wrote and received approval for CN-02. Incorporated CN-02 and ..."

At that point, and in mid-sentence, a log entry for 15:00 was annotated.

Failure to maintain the sequence of events in the chronological test log was identified by the inspector as a weakness. The licensee stated that additional direction with respect to maintenance of the chronological test log will be addressed as a part of the startup corrective action plan. This item will be reviewed as part of the continuing examination of the preoperational test program.

3. Preoperational Test Procedure Review (70300)

a. PTI-002-01, Condensate, revision 0

The condensate system is a non-safety related, secondary plant system. It serves to transfer condensed steam from the main condenser to the suction of the main feed pumps via the condensate

demineralizers. The condensate demineralizers remove impurities from the condensate stream to ensure they do not collect and concentrate in the steam generators.

This procedure was reviewed to ensure that the test objectives and acceptance criteria of the FSAR Chapter 14 Test Summary (this test summary also includes the test requirements for the Condenser Vacuum System) were properly incorporated. The inspector was satisfied with the adequacy of this procedure to meet the FSAR Test Objectives and Acceptance Criteria. Particular attention was paid to valve interlocks associated with this system to ensure that they were properly tested. Previous review of PTI-27-01, Condenser Circulating Water System identified a violation (Inspection Report 93-53) in which valve interlocks were not properly tested. Testing of the valve interlocks in PTI-002-01 was properly specified.

No violations or deviations were identified in the review of PTI-002-01.

b. PTI-063-01, SIS Integrated Test, revision 0

PTI-063-01, SIS Integrated Test, was developed to verify that adequate NPSH was available to the Emergency Core Cooling System Pumps when taking suction from the RWST.

The NRC inspector reviewed PTI-063-01, Revision 0, to determine if the test procedure was technically and administratively adequate, contained adequate test controls, would satisfy the stated test objectives and to verify the incorporation of applicable test commitments contained in the FSAR, RG 1.68 and RG 1.79.

The inspector determined that the test procedure was inadequate. Problems identified in the procedure were similar to those discussed in NRC Inspection Report 50-390, 391/93-61 for PTI's 63-02 [SIS Accumulator] and 63-03 [Charging, Safety Injection and RHR Flow Balance Test]. These inadequacies were such that they would have adversely effected the PTI test objectives, test results and acceptance criteria. Examples of some of the most significant items are as follows:

- SMP-8.0, paragraph 2.3.C.1, requires precautions and limitations be included in the instruction section of the procedure. The procedure did not include the precautions or limitations stated in section 3.0 in the section 6.0, instruction section. In addition, a number of the precautions and limitations required for safe operation of the pumps were not included in the procedure. These include run-out limitations and minimum flow requirements.

- Prerequisite steps 4.3.24, 4.3.25 and 4.3.26 verified component cooling water available to supply cooling for the pumps. The component cooling water system flow balance has not been performed. The procedure did not provide guidance or precautions and limitations that would ensure adequate cooling was available to protect the pumps.
- The procedure operates the residual heat removal, safety injection, centrifugal charging and containment spray pumps. Prerequisite step 4.2.12 verified testing for the residual heat removal, safety injection and centrifugal charging systems had been completed to the extent necessary to support testing. There is no similar prerequisite step to verify that testing of the containment spray system was complete to the extent necessary to support this test.
- Steps 4.3.11 and 4.3.12 of the procedure installed test gauges to monitor RHR pump discharge pressure. These steps stated that this is required only for subsection 6.3. The test gauges were actually required during the performance of subsection 6.1.
- Data Sheets 8.1, 8.2.1 and 8.2.2 contain duplicate step numbering, incomplete and inconsistent instructions as follows:

Data Sheet 8.1 contains duplicate Steps 6.1.58.A and 6.1.58.B.

Data Sheet 8.2.1 contains four Steps 6.2.46.A and duplicate Steps 6.2.46.B.

Data Sheet 8.1 Step 6.1.53.B requires the calculation of an average RWST temperature and the determination of vapor pressure as a function of this average temperature. No provision is made to record the average temperature.

The calculations performed on the data sheets require data from other parts of the data sheet. The procedure did not always specify the specific step on the data sheet where the data for the calculation was to be obtained.
- Step 6.1.25 of the procedure established a simulated seal injection flow rate of 78-80 gpm. WAT-D-9347, Westinghouse ECCS Analysis Technical Report, dated June 11, 1993 (RIMS T33 930611 831) requires a simulated seal injection flow rate of 80.9-86.9 gpm.
- The NPSH calculations performed in data Sheet 8.1 correct the test data based on recorded RWST levels. The procedure used a conversion constant of .337 ft/% level indication in the calculation. The procedure did not list a scaling reference that could be used to verify this conversion constant. The

inspector obtained a copy of Eagle 21 Scaling Document SSD-1-63-50, Revision 0, Process Parameters, Setpoint and Scaling Document for Watts Bar Nuclear Plant Unit 1 Refueling Water Storage Tank Level Channel 1-L-63-50 (TVA RIMs No. T33 930603 930). SSD-1-63-50 specified a process range of 0-100% RWST level which corresponded to an instrument span of 387 inches of Water Column (WC). This would result in a conversion constant of .3225 ft/% level indication.

- Step 4.3.14 provides instructions for connection of one channel of the data logger, specifically:

Connect test leads from Test Point 1FP/917 in Panel 1-R-21 to the data logger per Appendix F.

Appendix F does not list a channel with the description "1FP/917." After review of the referenced scaling and setpoint documents, it was determined that 1FP/917 is the designation for the test point in the FT-63-170 loop. Appendix F assigns Channel 000 of the data logger to this loop.

Connection instructions for nine of the eleven raw data channels for the data logger are inadequately specified in this manner.

The problems identified above with PTI-063-01 are additional examples of a failure to perform adequate technical reviews of preoperational test instructions. This problem was cited as a violation in NRC Inspection Reports 50-390,391/93-53 and 93-61. The licensee stated that the corrective action for PTI-63-01 will be included in the response to the Notice of Violation. This response was still pending at the time of the inspection. IFI 50-390/93-71-04 was identified to track this process and to verify that the NRC comments identified with the procedure are adequately resolved by the licensee.

4. Preoperational Test Witnessing (70312)

a. PTI-063-02, SIS Accumulators, revision 0

The inspector observed testing involving the fill and subsequent low pressure blowdown of the #1 accumulator to the open reactor vessel (the #2 accumulator had been previously tested by this procedure). The following concerns were identified:

- During the fill of the #1 accumulator utilizing the safety injection pumps, the inspector was in the reactor compartment. It was visually observed that the permanent fill piping was vibrating during this filling evolution. The piping involved was downstream of pneumatic Valve FCV-63-115 and included approximately 20 feet (total) of unsupported vertical and horizontal piping including a horizontal span containing a

manual globe valve. This was subsequently discussed with Engineering (and they produced documentation showing) that the piping had been analyzed in the configuration observed by the inspector. Nevertheless, this piping is easily displaced by modest hand pressure, and it was observed by the inspector that the equivalent span for the #3 accumulator contains at least 3 additional supports.

IFI 390/93-71-05 will be utilized to track resolution of vibration in this fill piping and the difference in as-built configuration between this piping and geometrically similar piping on the #3 accumulator.

- Following the completion of the #1 accumulator, fill the inspector observed the low pressure blowdown from the control room. At the moment of opening the accumulator discharge isolation valve from the Unit 1 control room, the inspector went to the location of the data recorders located in the Unit 2 control room to observe the stripchart recording traces for accumulator pressure, level and valve position as the blowdown proceeded. There it was noted that the traces for valve position were not being recorded as required by procedure. When questioned the instrument technician indicated that he believed these traces were not required for the low pressure portion of the procedure. The inspector informed the test director that the data had not been recorded and the test director determined that the channel inputs for valve position had been turned off. Subsequently the test director also determined that the equalizing valve for the low pressure dp cell utilized for this portion of the test had been left open. As a result of these two problems the low pressure blowdown of the #1 accumulator had to be repeated. This sequence is identified as a weakness in the conduct of testing caused by a poor test briefing that failed to review with the individual responsible the data needed to be recorded and a lack of attention to detail in the fill and vent of the dp cell.

5. Exit Meeting

The inspection scope and results were summarized on September 30, 1993, with those persons indicated in paragraph 1. The inspectors described the areas inspected and discussed in detail the inspection results listed below. At the exit meeting, the licensee stated that the deficiencies identified for PTI-063-01 will be addressed in their response to the violations identified in NRC Inspection Reports 50-390,391/93-53 and 93-61. Dissenting comments were not received from the licensee. Proprietary information is not contained in this report.

<u>Item Number</u>	<u>Status</u>	<u>Description and Reference</u>
390/93-71-01	Open	VIO - Failure to Follow Procedure - PTI-232-01 Test Results Package did not contain all of the documentation required by SMP-9.0 (paragraph 2.b.)
390/93-71-02	Open	IFI - Licensee's Evaluation of DN's 07 and 08 PTI-212-01 (paragraph 2.a.)
390/93-71-03	Open	IFI - Clarification of Requirements for Incorporation of Change Notices (paragraph 2.b.)
390/93-71-04	Open	IFI - Verify Adequacy of PTI-063-01, Revision 1 (paragraph 3.b.)
390/93-71-05	Open	IFI - Accumulator Fill Line Vibration Evaluation (paragraph 4.a.)

6. Acronyms and Abbreviations

CN	Change Notice
CRS	Concerns Resolution Staff
DN	Deficiency Notice
dp	Differential Pressure
ECCS	Emergency Core Cooling System
FSAR	Final Safety Analysis Report
gpm	Gallons per Minute
IFI	Inspector Follow Item
in WC	Inches Water Column
JTG	Joint Test Group
MTS	Master Tracking System
NPSH	Net Positive Suction Head
NSSS	Nuclear Steam Supply System
PER	Problem Evaluation Report
PTI	Preoperational Test Instruction
QA	Quality Assurance
QDCN	Q-Type Design Change Notice (used to answer questions or provide clarification)
RG	Regulatory Guide
RHR	Residual Heat Removal
RIMS	Records Information Management System
RWST	Reactor Water Storage Tank
SCAR	Significant Corrective Action Report
SIS	Safety Injection System
SMP	Startup Manual Procedure
SSD	Scaling & Setpoint Document
TD	Test Director
TE	Test Engineer
V	Volts
VIO	Violation