TVA

Tennessee Valley Authority, Post Office Box 2000, Spring City, Tennessee 37381

NOV 02 1994

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Gentlemen:

In the Matter of the Application of) Docket No. 50-390
Tennessee Valley Authority)

WATTS BAR NUCLEAR PLANT (WBN) - UNIT 1 - RESPONSE TO NRC'S SEPTEMBER 15, 1994 ASSESSMENT OF WBN UNIT 1 HOT FUNCTIONAL TESTING

Enclosure 1 provides TVA's response to the subject letter concerning the Unit 1 Hot Functional Test Program conducted at WBN in the Spring of 1994. As requested, our response provides TVA's assessment of the hardware and operational issues documented by the staff's letter and our plans and schedule for using the lessons learned to enhance future testing. The attachment to Enclosure 1 provides a summary of the causal factors, corrective actions, and retest plans and schedules for each of the major equipment issues cited in NRC's letter. Enclosure 2 summarizes the commitments made in this response. The staff was informed of the delay in providing this response on October 18, 1994.

If you should have any questions, contact Bruce S. Schofield at (615)-365-1857.

Sincerely,

Dwight E. Nunn

Dwight E. Nunn
Vice President
New Plant Completion
Watts Bar Nuclear Plant

Enclosures
cc: See page 2

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ENCLOSURE 1

WATTS BAR NUCLEAR PLANT UNIT 1
TVA'S ASSESSMENT OF HOT FUNCTIONAL TESTING ISSUES
RESPONSE TO NRC LETTER OF SEPTEMBER 15, 1994

LIST OF ABBREVIATIONS

ABGTS	AUXILIARY BUILDING GAS TREATMENT SYSTEM
ACR	AUXILIARY CONTROL ROOM
AOI	ABNORMAL OPERATING INSTRUCTION
CAP	CORRECTIVE ACTION PROGRAM
CCP	CENTRIFUGAL CHARGING PUMP
CCS	COMPONENT COOLING SYSTEM
CILRT	CONTAINMENT INTEGRATED LEAK RATE TEST
CKV	CHECK VALVE
CPS	COUNTS PER SECOND
CRDM	CONTROL ROD DRIVE MECHANISM
CVCS	CHEMICAL AND VOLUME CONTROL SYSTEM
DBVP	DESIGN BASELINE VERIFICATION PROGRAM
DCN	DESIGN CHANGE NOTICE
EGTS	EMERGENCY GAS TREATMENT SYSTEM
EHC	ELECTRO-HYDRAULIC CONTROL
ERCW	ESSENTIAL RAW COOLING WATER
FCV	FLOW CONTROL VALVE
FSAR	FINAL SAFETY ANALYSIS REPORT
GOI	GENERAL OPERATING INSTRUCTION
HFT	HOT FUNCTIONAL TEST
II	INCIDENT INVESTIGATION
LCV	LEVEL CONTROL VALVE
M&TE	MEASURING AND TEST EQUIPMENT
MCR	MAIN CONTROL ROOM
MDAFW	MOTOR DRIVEN AUXILIARY FEEDWATER
MDFP	MOTOR DRIVEN FEEDWATER PUMP
MOVATS	MOTOR OPERATED VALVE ANALYSIS AND TESTING SYSTEM
MSSV	MAIN STEAM SAFETY VALVE
MTS	MASTER TRACKING SYSTEM
NIS	NUCLEAR INSTRUMENTATION SYSTEM
OVT	OPEN VESSEL TESTING
PASS	POST-ACCIDENT SAMPLING SYSTEM
PDP	POSITIVE DISPLACEMENT PUMP
PER	PROBLEM EVALUATION REPORT
PORV	POWER OPERATED RELIEF VALVE
PTI	PREOPERATIONAL TEST INSTRUCTION
PTLR	PRESSURE/TEMPERATURE LIMITS REPORT
QA	QUALITY ASSURANCE
RCP	REACTOR COOLANT PUMP
RCS	REACTOR COOLANT SYSTEM
RFV	RELIEF VALVE
RHR	RESIDUAL HEAT REMOVAL
RTD	RESISTANCE TEMPERATURE DETECTOR
RVLIS	REACTOR VESSEL LEVEL INSTRUMENTATION SYSTEM
S/G	STEAM GENERATOR
SDOMCR	SHUTDOWN FROM OUTSIDE MAIN CONTROL ROOM
SFV	SAFETY VALVE
SI	SAFETY INJECTION
SOI	SYSTEM OPERATING INSTRUCTION
SQN	SEQUOYAH NUCLEAR PLANT
TDAFW(P)	TURBINE DRIVEN AUXILIARY FEEDWATER (PUMP)
TOP	TEMPORARY OPERATING PROCEDURE
WO	WORK ORDER
WR	WORK REQUEST

Executive Summary

The WBN Hot Functional Test Program (HFT) was conducted beginning April 1, 1994, and was concluded on June 8, 1994. The HFT Program was developed and implemented to allow optimal use of the plant operating environment. In addition to the performance of equipment testing under as close to actual operating conditions as practicable, HFT enabled TVA to monitor and assess areas important to a successful plant startup such as the conduct of operations and the adequacy of some plant procedures. This effort allowed Watts Bar to identify and implement improvements in a number of areas prior to fuel loading and initial power operations. Over 30 major preoperational tests were performed in support of HFT at various RCS temperatures and pressures ranging from ambient conditions to the normal operating temperature and pressure of 557°F and 2235 psig, respectively. Major objectives for HFT were as follows:

- Demonstrate, in accordance with design, the performance of integrated systems under operating conditions
- Evaluate the operational readiness of the plant
- Promote the interfacing teamwork of site departments (interface of maintenance, engineering, operations, etc.)

Hot Functional Testing was successful in addressing the above objectives. TVA's Nuclear Assurance assessment of HFT concluded that testing, operations, and support activities were acceptable; that HFT was performed in accordance with procedural requirements; and that system tests were performed in a satisfactory manner which will support safe operation of the plant during the power ascension phase of the initial test program. As expected for a comprehensive test program, several equipment issues were identified which have been or will be resolved and retested. Some of the more significant equipment problems encountered included thermal binding failures of the Residual Heat Removal (RHR) Pump 1B-B, lifting of a pressurizer safety valve, and reliability concerns with the turbine driven auxiliary feedwater system. These issues as well as some others addressed herein will undergo testing during an additional heatup to be performed in January 1995. TVA is currently developing a readiness plan for this heatup which will be made available to the staff.

The WBN HFT was a valuable learning experience for site departments requiring their continuous interface and problem resolution under demands typical of an operating facility. The HFT demonstrated the proficiency of Operations personnel in both administrative and technical aspects of operating the plant. However, some areas were identified as needing improvement for the Operations staff and are being addressed as part of WBN's overall preparations for fuel load. These areas include a need for greater command/control and sense of plant ownership and weaknesses in configuration management. Areas for improvement were also identified for other site departments, some of which are discussed herein.

TVA presented the staff with the results of HFT, including detailed "lessons learned" on several recent occasions. This report provides our assessment, lessons learned, and schedule for retests for the specific issues raised in the staff's letter of September 15, 1994, and should not be considered a comprehensive account of the entire HFT program. A number of detailed assessments, audits, and inspections of HFT were performed by TVA and NRC representatives, the results of which are documented in various reports. Reports prepared by TVA are available upon request. In addition, several preoperational test results data packages for HFT have been provided to NRC onsite inspection personnel. The delays in issuing these reports primarily pertain to the resolution of outstanding test issues (e.g., post-test calibrations, engineering evaluations, etc.).

The programmatic concerns and equipment problems discussed in NRC's letter of September 15, 1994, are discussed in Parts I and II of this enclosure, respectively. The attachment to this enclosure provides a summary of the causal factors, corrective actions, and retest plans and schedules for each of the major equipment issues cited in NRC's letter.

I. Response to NRC Programmatic Areas of Concern

The following provides TVA's assessment of the programmatic concerns discussed in the staff's letter. These issues may be grouped into four categories: (1) Schedule Issues and Incomplete Work, (2) Problem Solving, (3) Operational Issues, and (4) Test Conduct Lessons Learned.

Schedule Issues and Incomplete work

The WBN HFT was developed and scheduled to demonstrate realistic operation of the RCS and readiness of personnel while providing sufficient early indication of any potential equipment issues which would require correction and retesting prior to plant fuel load. While this approach required that specific plant equipment/components were complete (i.e., installed, tested, calibrated, etc.) to the extent required to support the HFT test plateaus, other work was ongoing in accordance with overall system completion schedules. This equipment and other initiatives (WBN CAPs, corrective action documents, enhancements from industry experience, etc.), require completion in support of WBN Unit 1 fuel load, but were determined through the HFT preplanning process to have little or no impact on HFT. This planning process involved detailed evaluation and categorization of open issues within the master tracking system (MTS) to determine those equipment items and other issues which needed to be complete in support of testing. The evaluations were performed by a multi-disciplined review team. This process was described in detail in the HFT Readiness Program Plan, March 1994.

The staff is correct in noting that TVA entered HFT with ongoing work; however, as discussed above, this work was evaluated for impact to HFT and was not in response to schedule pressure. The HFT schedule was based on realistic estimates (from industry experience) which generally accounted for testing and resolution of issues. To be clear, the on-schedule completion of items determined necessary in support of HFT (or other testing) was and continues to be the expectation. Thus, when schedule deviations occurred during HFT, significant management attention and resources were applied to minimize impacts on the overall HFT schedule. While this process sometimes involved reevaluation/reclassification of open items or adjustment of priorities (e.g., expediting material orders or, in the extreme, an engineered redetermination that a planned component replacement may not be necessary), such decisions required an appropriate justification. The guidance for HFT and for current testing remains the same - equipment should be complete before undergoing preoperational testing.

The process to identify and schedule work activities needed in support of HFT was effective. However, the amount of incomplete work in March 1994, was substantially greater than currently exists, and challenged our processes. In some instances, errors were made in classifying open items or in properly scheduling and performing known work in support of testing. Although not preferred, in many cases the barrier against such occurrences going undetected is the preoperational test process itself. For example, an incomplete cable termination identified through testing would require the initiation of a formal test deficiency notice to ensure proper issue resolution, including a determination of any required retests. Preoperational testing has been effective in identifying instances of incomplete work of a functional nature.

To address these issues and reduce challenges to the testing barrier, several initiatives have been undertaken. In addition to establishing a more accurate fuel load schedule[1], improvements have been made in the daily planning processes, the Plan of the Day report (which now provides detailed schedule "fragnets" for key issues), system readiness walkdowns by Startup and Test with greater management involvement, and continued improvement in communications between departments. These techniques were successful during open vessel testing and containment integrated leak rate testing and will be continued. As systems and equipment continue to be "turned over" for Plant ownership subsequent to testing, and as the amount of remaining construction work declines, TVA expects to observe improved performance in the accurate identification and completion of activities required in support of testing. These actions should further enable test conduct to be performed as scheduled.

Problem Solving

The degree and formality of investigative efforts in resolving equipment problems during testing, and the expertise applied, is dependent upon the complexity of issues and the likelihood of having identified credible solutions. During HFT, problem investigation could have been more exhaustive in some cases. However, the variety of equipment issues which arose and the possibility they could be interrelated often warranted collecting as much test data as possible. TVA considers that testing of systems was performed in a consistent manner with appropriate judgements made to the extent necessary to proceed to the next test iteration.

For example, during early testing of the hydraulic performance of the TDAFW System, suspected problems of excess water present at the trip and throttle valve (1-FCV-1-51) were temporarily alleviated when the turbine started on the third attempt and ran properly. Although this early testing sequence

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1 The WBN integrated fuel load schedule issued in June 1994 was developed from the bottom-up, based on known work activities, with confirmation by all site departments and management levels. The schedule is considered more accurate than previous efforts and has allowances for contingencies and unforeseen circumstances.

increased our awareness over potential steam trap issues which would be challenged to a greater extent later (during the endurance run and pump restart tests), the failure of the first two start attempts did not warrant termination of the test. Instead, it suggested that more testing be performed to gain sufficient insight of the overall equipment performance problems through integrated testing. Likewise, the cause of the trip at 46 hours during the first full endurance run was inconclusive but suspected to be related to marginal steam traps. After trouble shooting, inspection, and engineering evaluations, at that time, no single event could be isolated as the source of the trip and the endurance run was restarted. Concurrently, the need for possible modifications and maintenance for steam traps and environmental issues (leakage of seals, unions, and valves) was under consideration and eventually incorporated. Subsequent evaluation, however, indicated that rerouting of drain lines was of little benefit. Some of the TDAFWP equipment issues, such as the speed control problems, could have been evaluated more fully to gain sufficient understanding of their effect on overall system performance. Thorough trouble shooting of the speed controller was eventually undertaken but this effort would have been more beneficial had it occurred earlier. As discussed below, Startup and Engineering have increased efforts in this area.

TVA's investigative actions for the RHR 1B-B pump failures were thorough, but unable to identify the venting problem initially. A formal incident investigation (II) composed of multi-disciplined team members had concluded that two or more potential failure mechanisms (misalignment, minimal clearances, thermal transient, and insufficient venting) contributed to the first failure. However, the investigation team was unable to obtain evidence of improper venting, and it was not considered to be a significant contributor to the event. Consequently, corrective measures taken to improve the venting process after the first failure were not as rigorous as later determined necessary. Subsequent to the second failure, another II team conducted a more comprehensive root cause analysis which evaluated many possible causes. This team had the benefit of additional data and was able to eliminate several primary failure mechanisms. During detailed reviews of RHR system temperature data, the team concluded that a significant amount of air had existed in the RHR B-train system prior to the second failure. This was confirmed by subsequent testing. As a result, the team determined the most probable cause for the event was improper system venting resulting in voids in the pump combined with a thermal transient leading to pump seizure. As discussed in the attachment, detailed corrective actions were developed to address this issue as well as other potential failure mechanisms. TVA considers that a closer examination of the original test performance (1983 timeframe) and related venting procedures may have assisted in problem resolution subsequent to the first failure. TVA is addressing lessons learned from previous WBN testing for upcoming major preoperational tests. These tests include Integrated Testing Sequence, ABGTS, EGTS, and Main Control Room Pressurization.

The staff noted that the first response of engineering was to try to rationalize problems rather than to find the root cause and deal with it. TVA does not agree with this characterization. Site Engineering is routinely involved in a lead role, or in a support capacity, in the evaluation and resolution of significant testing issues and equipment problems. As discussed, problem complexity normally determines the extent of resources applied in developing the problem solution. To expedite thorough resolution of more significant HFT issues, a dedicated team was established in the Engineering Department. The knowledge base and depth of experience brought by these "problem-solvers" provides a valuable focal point for problem investigation with few distractions due to their limited scope of responsibility. Likewise, several evaluators/problem-solvers with operational experience were reassigned from Browns Ferry Nuclear Plant to the WBN Startup and Test Department. These individuals have been beneficial in directing/assisting trouble shooting activities during the latter stages of HFT and subsequent testing. We expect to continue using this problem solving approach, as necessary, for the remainder of the preoperational test program.

TVA notes that alternative solutions which do not involve hardware modification are often available, and even optimal if non-invasive, cost-efficient, and technically sound. These solutions, frequently termed "accept-as-is," are sometimes used to disposition initially unacceptable test results. Some of the test deficiencies categorized "accept-as-is" by Startup, upon further evaluation by Site Engineering, were found to be in accordance with the existing design criteria. It should be recognized that the WBN project has the advantage of a reconstituted calculation and design basis which has been validated in various reviews and inspections. Site Engineering's experience with these calculations provided insight into available design margins that other recent plant startups may not have had. For this reason TVA's Engineering staff could and did make informed decisions to accept test results "as-is" and then change design basis documents to match. This should not be construed as an attempt to rationalize problems/test deficiencies but rather a demonstration of a methodical, engineered solution. In several cases, Engineering determined that test deficiencies could be more appropriately resolved with hardware changes, reflecting on management's expectation for optimized system performance.

Operational Issues

TVA agrees with the observation that an improvement is necessary in the ownership of the plant as well as the use of procedures. The Operations staff will be responsible for controlling the plant, including utilizing upgraded procedures (e.g., SOIs and GOIs) to the extent possible, during the January 1995 heatup. Operational lessons learned during and subsequent to the HFT are being rolled out to Operations personnel at crew meetings, shift turnovers, and during training meetings. Attempts are being made to reinforce management expectations and provide timely and complete feedback to help prevent recurrence of problems. As discussed earlier, a readiness plan is being developed for this heatup and will be made available to the staff.

Test Conduct Lessons Learned

Hot functional testing proved to be a significant benefit in preparing test personnel and test processes for future testing activities. Virtually all aspects of the test program were affected. Improvements were achieved in the following areas: (1) Test procedure preparation and reviews, (2) System/Test familiarity including simulator training, (3) System Readiness Walkdowns, (4) Pretest briefings, (5) Shift test coordination and interface with operations, (6) Problem solving capabilities, (7) Knowledge of the Plant and administrative processes, and (8) Personnel communications.

In addition, Startup is evaluating test procedures and results from the previous test program (1983 timeframe) to determine potential impacts on current testing. This includes a review of the following elements: (1) Identify acceptance criteria changes which may precipitate test deficiencies, (2) Identify potential recurrent test deficiencies, and (3) Identify major equipment modifications which could precipitate test deficiencies. These reviews will be performed for the following tests: Integrated Safeguards, EGTS, ABGTS, and Main Control Room Pressurization.

II. Analysis of Specific equipment issues

The following provides an assessment of the equipment issues discussed in the NRC letter. TVA's specific response, including detailed schedules, is provided for each of these issues in the attachment to this enclosure. Referring to Figures 1 and 2 (Pages 9-11), our analysis indicates that 80 percent of the problematic issues are represented by three categories: (1) Design issues, which constitute the majority of items, (2) Pre-test grooming activities, and (3) Operational issues. Isolated examples of insufficient testing and maintenance were observed and are discussed in the attachment. A fourth category, Equipment Tuning, is composed of those items which typically require adjustment/correction during testing.

Design

To the extent possible, hot functional testing provided a confirmation of the reconstituted design of WBN with good overall correlation between system performance and engineering documents. This process provides evidence of the effectiveness of the DBVP (including design configuration control) and the calculation regeneration programs, and other initiatives intended to confirm the adequacy of the WBN design. In addition, HFT demonstrated the effectiveness of the design change process through performance of a wide range of modifications.

In some cases, (e.g., design changes to allow for increased PORV stroke times), grooming of the design basis documents was necessary to capture the as-tested performance. In other examples, isolated errors arose due to insufficient review/checking or inattention to detail resulting in: scaling document errors (RCP seal injection), improper specifications for vendor testing of safety valves, and improper consideration of all required equipment operation modes (Valve 1-FCV-62-93 and TDAFW Nitrogen valves). More thorough engineering reviews of proposed preoperational tests would have been likely to detect some of these issues.

With regard to problems with the TDAFWP steam traps and MDAFW level control valves, marginal design could have been overcome with closer attention to industry experience. To some degree, however, this equipment contained WBN unique design features and required the benefit of integrated testing in order to fully identify design weaknesses and provide comprehensive resolutions. The design of the MDAFW LCV control scheme had been improved in response to maintenance issues at Sequoyah Nuclear Plant (SQN), however, differences in system pressures dictated the use of a different design solution at WBN from that used at SQN. Thorough testing allowed determination of a credible solution.

Finally, insufficient design interface/guidance for Operations resulted in weaknesses in equipment operation procedures, e.g., venting and operational requirements for the positive displacement pump.

These issues indicated that improvements, as summarized below, were necessary. TVA believes these elements have been or are being addressed in the process of completing remaining activities associated with development and implementation of outstanding design. Several of these improvements had already been emphasized and or incorporated in our design processes subsequent to the occurrence of the design deficiencies.

- Incorporation of industry lessons learned
- Thorough design reviews and attention to detail
- Operational responsiveness
- Overall problem solving
- Ownership of technical issues
- Feedback from testing of design features
- Improved communication/interface
- Improved review by engineering of preoperational tests

Pre-test Completion Activities

Pre-test completion activities consists of routine actions which place equipment and components in the required state of readiness prior to formal preoperational testing. Examples include cleaning and inspection, routine maintenance, component testing, calibrations, chemistry verification, preparation of measuring and test equipment, etc. Overall, good performance was exhibited for these activities.

As noted in the staff's report, some configuration problems were identified with RTDs used with RVLIS. These issues resulted from insufficient component testing and errors in attention to detail, and required development of appropriate recurrence controls. Hundreds of calibrations were required in support of HFT, the majority of which were satisfactory. In isolated instances though, as with calibration of steam generator PORV controllers, the initial pretest calibration required adjustment during testing. TVA has noticed that as testing has progressed (HFT, OVT, etc.), instrument technicians have had additional opportunities for "hands-on" familiarity with infrequently calibrated instruments. This has resulted in observed improvements in calibration. In addition, test personnel familiarity with instrument responses has improved. In some cases, instrument drift has resulted in adjustments being necessary under process conditions (refer to Tuning). The usage of M&TE during HFT was assessed as adequate but areas for improvement were noted, including assurance that M&TE utilized complies with the test procedure and that calibration due dates are in agreement with expected test durations. Challenges to the TDAFW System during the endurance run could have been minimized with improved pretest grooming activities (e.g., system readiness verification, inspection and repair of steam leaks, etc.).

As discussed above (refer to Schedule Issues), additional confirmation that systems are ready in support of preoperational testing is being achieved through better reviews and scheduling of open MTS items. The pre-test preparation process has also benefited from more thorough test engineer walkdowns of test procedures resulting in early identification of oil leaks, damaged equipment, incorrect nomenclature, etc. Similar walkdowns of preoperational test procedures by Operations and the test procedure author have been formally instituted since HFT was completed.

Operations Procedures/Process

The significant improvement planned in this area is the use of upgraded operating instructions in support of the next heatup. Although this will involve the use of TOPs for some systems, these procedures will have been upgraded consistent with current design, but will not have been through the final validation process. In addition, Engineering is providing additional guidance for specific activities such as proper equipment venting and appropriate operating precautions/limits (e.g., PDP flow transients, safety valve heatup limits, etc.). Operational considerations were a key aspect of TVA's design baseline efforts, however, HFT provided an appropriate opportunity to identify areas where additional guidance was necessary.

Equipment Tuning

This category consists of issues which typically require adjustment during testing. Examples in this category include RCP vibration, various valve and steam leaks, and the response of some control systems (e.g., pressurizer pressure control). While this category should not detract from the importance of pretest activities such as system walkdown inspections and equipment calibrations, it addresses those items which are properly designed and installed and whose accurate adjustments depend on testing under process conditions. As an exception, in some cases such as the slow response of the pressurizer level control, design changes were necessary when tuning adjustments alone were not prudent or not achievable. Although the pressurizer level control response was not unacceptable, system testing indicated the response needed improvement and required changing the original specified controller model. TVA expects to encounter additional equipment tuning needs as preoperational testing continues.

FIGURE 1

EQUIPMENT ISSUES FROM NRC'S SEPTEMBER 15, 1994 LETTER

ISSUE	DESIGN	OPERATIONS	PRETEST PREPARATION	MAINTENANCE	TESTING	TUNING
TDAFWP - RELIABILITY/ENDURANCE	X		X	X		X
TDAFW - LEVEL CONTROL VALVES	X					
TDAFW - PUMP BINDING				X		
RESIDUAL HEAT REMOVAL PUMP 1B-B SEIZURE		X				
PRESSURIZER LEVEL CONTROL - POSITIVE DISPLACEMENT PUMP	X					X
PRESSURIZER LEVEL CONTROL - CENTRIFUGAL CHARGING PUMP	X					X
PRESSURIZER LEVEL CONTROL - LOW CHARGING FLOW	X					
PRESSURIZER LEVEL CONTROL - MECHANICAL VALVE STOP (FCV-62-93)	X					
MOTOR DRIVEN AUXILIARY FEEDWATER FLOW CONTROL	X					
PRESSURIZER SAFETY VALVES (LEAKAGE/SETPOINTS)	X	X				
PRESSURIZER PRESSURE CONTROL					X	X
REACTOR COOLANT PUMP - VIBRATION						X
REACTOR COOLANT PUMP - OIL ANALYSIS			X			
RVLIS (RTDs/THERMOCOUPLES)			X			

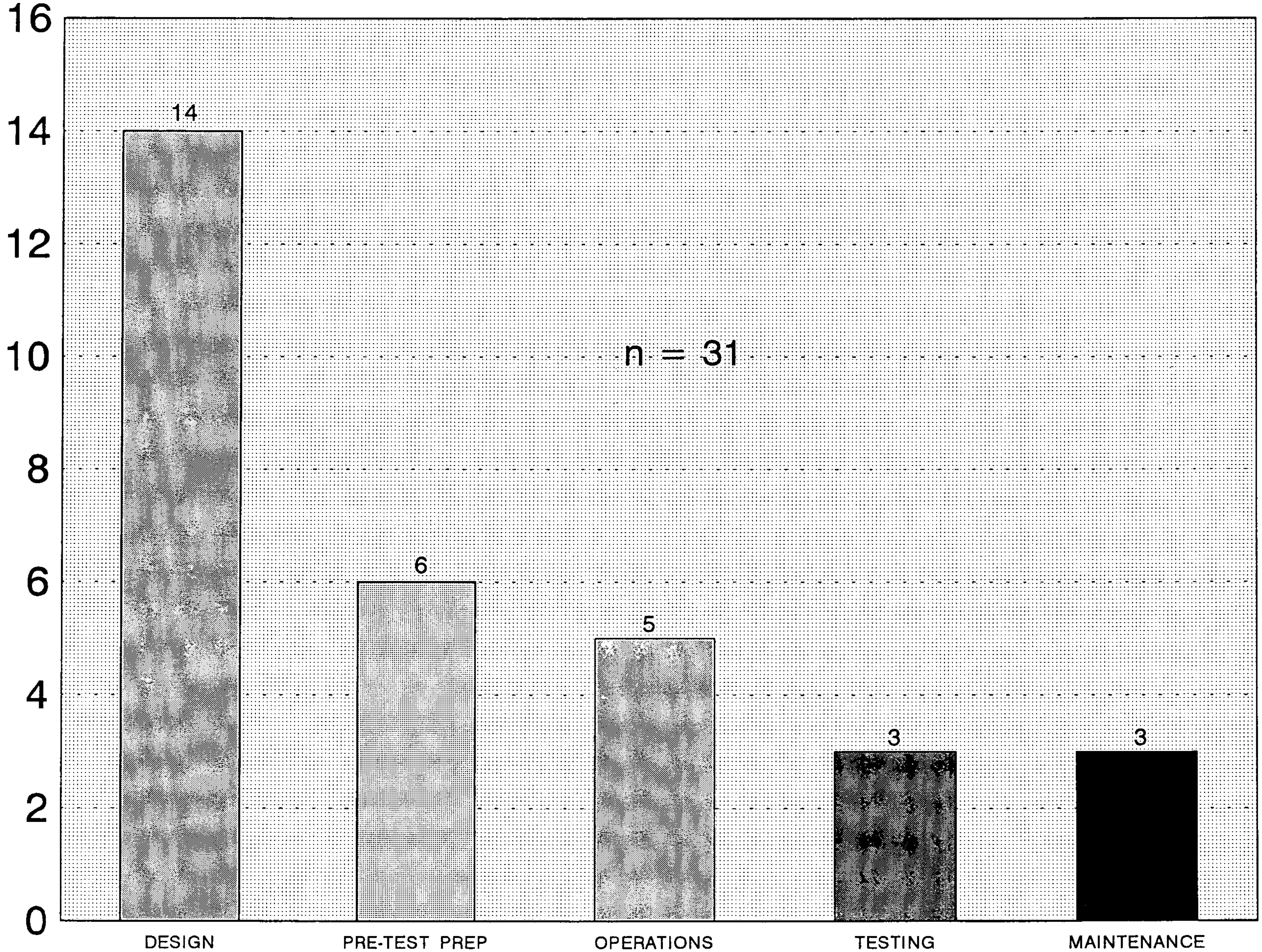
FIGURE 1

EQUIPMENT ISSUES FROM NRC'S SEPTEMBER 15, 1994 LETTER

ISSUE	DESIGN	OPERATIONS	PRETEST PREPARATION	MAINTENANCE	TESTING	TUNING
SDOMCR - PRESSURIZER COOL DOWN LIMITS		X				
SDOMCR - RHR PUMP SUCTION VALVE			X			X
SDOMCR - CCS TEMPERATURE		X				
SDOMCR - SG PORV CONTROLLERS			X			
SDOMCR - EQUIPMENT CONTROL TRANSFERS		X				
POST ACCIDENT SAMPLING SYSTEM					X	
SAFETY INJECTION SYSTEM CHECK VALVE LEAKAGE						X
RHR DISCHARGE CROSS TIE VALVE - PRESSURE LOCKING	X					
STEAM DUMP VALVE RESPONSE TIME	X					
STEAM GENERATOR SAFETY VALVE					X	
CENTRIFUGAL CHARGING PUMP 1A-A VIBRATION	X					
TURBINE AND AUXILIARIES	X					X
STEAM GENERATOR PORV RESPONSE TIME	X					
BORIC ACID TRANSFER PUMPS HEAD/FLOW	X					
TARGET ROCK VALVE PERFORMANCE						X
EAGLE 21 RACK 13 - CONNECTOR PROBLEMS				X		
STANDBY MAIN FW PUMP/LUBE OIL PUMP - VIBRATION						X
BACKUP SOURCE RANGE INSTRUMENTATION NOISE			X			
TOTALS	14	5	6	3	3	10

FIGURE 2

EQUIPMENT ISSUES FROM NRC'S SEPTEMBER 15, 1994 LETTER



ATTACHMENT

SUMMARY OF ACTIONS PLANNED OR TAKEN TO ADDRESS SPECIFIC EQUIPMENT ISSUES IDENTIFIED IN NRC'S LETTER OF SEPTEMBER 15, 1994

Note: Alphabetical section headings (A-L) utilized in this attachment correspond with sections in NRC's letter.

A. TURBINE DRIVEN AUXILIARY FEEDWATER (TDAFW) SYSTEM

The following provides a discussion of the principal equipment issues encountered during HFT testing of the TDAFW System. The issues are subdivided into three areas: (1) TDAFW PUMP ENDURANCE/RELIABILITY, 2) TDAFW LEVEL CONTROL VALVES, and (3) TDAFW PUMP BINDING.

1. TURBINE DRIVEN AUXILIARY FEEDWATER PUMP ENDURANCE/RELIABILITY

Problem

The pump did not successfully complete the 48-hour endurance run.
Water became inducted into turbine exhaust.
Water entered control/lube oil.
Inaccurate test equipment (flow sensor) for flow during initial 48-hour run.

Cause

- Controller/governor problems.
- Steam leaks caused water accumulation in the turbine and governor control systems.
- Failure of steam traps.
- Improper gasket installation - poor corrective maintenance.
- Incorrect programming of M&TE flow sensor. Failure to verify instrument reading during start of endurance run.

Corrective Action

Controller/governor problems resolved by trouble shooting and replacement of equipment.

Steam leaks being corrected through turbine and governor valve disassembly and seal refurbishment.

DCN-30930 was issued to correct turbine and steam line drainage problem. This DCN also added control/lube oil sampling valves, which will enable on-line oil sampling.

Flow sensor was replaced with accurate device during endurance runs.

These modifications will be completed prior to the next heatup.

Test Status

The auxiliary feedwater system will be retested to demonstrate its endurance and reliability during the next heatup scheduled for January 1995. The retest will verify that all changes, as implemented by the above modifications, function as designed and that the control system operates properly over the design range of steam generator pressures.

2. TURBINE DRIVEN AUXILIARY FEEDWATER SYSTEM - LEVEL CONTROL VALVES

Problem

The response time of the level control valves (LCVs) was in excess of the required time.

Cause

The initial installed design of the backup nitrogen system did not provide sufficient isolation resulting in loss of nitrogen inventory. Subsequent bench testing determined that the reverse flow direction would result in acceptable operation. Accordingly, engineering approved a modification to install one of the isolation valves in the reverse flow direction. The vendor was not consulted for this change. The reverse flow installation restricted control air flow and resulted in unacceptable stroke times.

Corrective Action

During HFT, a temporary modification was installed to bypass the nitrogen valve to verify proper response of the level control system.

DCN-31275 was issued to provide new three-way valves for the air supply lines to the TDAFW level control valves to provide acceptable isolation and enable quicker response times.

This modification will be completed prior to the next heatup.

Test Status

The LCV stroke times will be retested in support of the next heatup.

3. TURBINE DRIVEN AUXILIARY FEEDWATER PUMP BINDING

Problem

The TDAFW pump experienced binding at the end of HFT.

Apparent Cause

A small quantity of resin beads/fines was found inside the pump casing.

Corrective Action

The pump was disassembled and cleaned.

The condensate system and water treatment facility were inspected and cleaned.

As a precaution, the pump was returned to the vendor for inspection and test.

The vendor observed that minor binding (under manual rotation) would be normal and as expected for this multi-stage pump given the presence of normal carbon steel wear products. This binding would not be present during operation.

The vendor has tested the pump and found performance to be acceptable.

Test status

The pump will be retested during the next heatup.

B. <u>RESIDUAL HEAT REMOVAL PUMP 1B-B SEIZURE</u>

<u>Problem</u>

The pump failed twice due to contact of wear ring with impeller.

<u>Cause</u>

- Insufficient system venting resulting in voids in the pump coupled with a rapid thermal transient.

- Errors in the pump operating procedure resulted in incomplete venting of the system.

- Other potential contributing causes were evaluated in TVA's Incident Investigation II-W-94-014 Report (refer to TVA letter to NRC, August 12, 1994).

<u>Corrective Actions</u>

Repair of the pump included:
- new stuffing box extension and wear ring
- new impeller
- modifications of the pump casing
- improved clearances and realignment

In addition, permanent plant operating procedures will be revised prior to the next heatup to improve filling and venting of the RHR System.

<u>Test Status</u>

The pump was tested under ambient conditions during open vessel testing (July 1994) without any problems. TVA will retest the RHR Pump 1B-B, at hot RCS conditions to demonstrate proper pump operation. This testing will include demonstration that RHR Pump 1B-B will start reliably and repeatedly under hot conditions. Testing will be performed during the next heatup.

C. <u>NON-SAFETY POSITIVE DISPLACEMENT CHARGING PUMP (REFER TO ITEM D)</u>

D. PRESSURIZER LEVEL CONTROL

There are four separate issues concerning equipment used for Pressurizer Level Control. They are (1) the response of the control system using the PDP, (2) the response of the control system using the CCPs, (3) the low charging flow causing excessive letdown temperatures, and (4) the valve stop installed on FCV-62-93. Note that FCV-62-93 is not part of the level control system for the PDP. Level control using the PDP is accomplished with the PDP speed controller. FCV-62-93 is used only during CCP operation.

1. NON-SAFETY POSITIVE DISPLACEMENT CHARGING PUMP

Problem

The PDP speed controller did not respond to automatic pressurizer level control. In addition, it was necessary to manually shut down the pump due to high noise/vibration.

Cause

- Accurate tuning of the speed controller required normal plant operating conditions at temperature and pressure.
- Gas binding caused noise and vibration:
  - a. Marginal suction piping design
  - b. No procedure requirements in place to address gas accumulation in suction and discharge accumulators
  - c. Vendor precaution to minimize full flow transients during pump start was not incorporated in operating procedures.

Corrective Actions

- The speed control problem was resolved by troubleshooting and tuning the level control and speed control circuits to effect the required response.
- To address gas binding, the following improvements are necessary to the pump operating procedures:

  a. Add precautions/requirement to place pump on mini-flow prior to starting pump.

  b. Add requirement to vent the pump and suction/discharge accumulators prior to starting pump.

  c. Add requirements to periodically check suction/discharge accumulators.

Test Status

During the next heatup, the speed controller will be retested, the PDP vibration will be monitored, and the accumulators will be observed.

2. CENTRIFUGAL CHARGING PUMP LEVEL CONTROL

Problem

The response to level transients during HFT exceeded the industry norms of 1-2 hours.

Cause

- Misapplication of controller.
- Control circuit tuning required at process conditions.
- Westinghouse does not prescribe specific acceptance criteria for this system (none required).
- Previous (1983 timeframe) HFT response either not noted or considered acceptable.

Corrective Actions

- Installed more appropriate controller of same type as SQN
- TVA adopted current industry norm for this test (1-2 hours)
- Testing with new controller during HFT resulted in an acceptable response time of 90-120 minutes.

Test Status

There are no plans to retest this portion of the system. Planned modifications to FCV-62-93 will not affect the response of the overall system.

3. LOW CHARGING FLOW IN REGENERATIVE HEAT EXCHANGER/HIGH LETDOWN TEMPERATURE

Problem

During testing of the pressurizer level control system, unacceptable high letdown temperatures occurred due to low charging flow to the regenerative heat exchanger.

Cause

The low flow in the charging line was caused by incorrect scaling of the flow instruments for seal injection, resulting in operators diverting more flow to seal injection.

Corrective Actions

Scaling for the seal injection flow instrumentation was corrected and the testing was reperformed.

Test Status

The results of the testing show good agreement with the response obtained at Sequoyah and are considered acceptable. There are no plans to retest this aspect of the system.

4. APPENDIX-R MODIFICATION (MECHANICAL STOP) TO 1-FCV-62-93 DID NOT ADDRESS LOW PRESSURE OPERATIONS

Problem

The mechanical stop installed on FCV-62-93 interfered with pressurizer level control at low RCS pressures preventing sufficient throttling to the desired flow.

Cause

The modification to address the Appendix-R event was designed for the worst-case condition (high RCS pressure). It was assumed that the worst case enveloped all operational modes including low pressure.

Corrective Actions

During HFT the valve stop was disabled from FCV-62-93 to allow HFT to be successfully completed.

Currently, a design change to add a pneumatic relay is in progress. This modification will not affect the response of FCV-62-93 during normal operation since the low stop will be set below the control range. This modification will be completed in support of the next heatup.

Test Status

An appropriate post-modification test (calibration/tuning) of the new design will be completed prior to heatup.

E. MOTOR DRIVEN AUXILIARY FEEDWATER PUMP FLOW CONTROL

Problem

Flow and pressure control valves became unstable at low flow.

The 4-inch LCV would not close under high differential pressure.

Note: Although the design of this system resulted in undesirable pressure and flow oscillations, the design was adequate to provide sufficient cooling for the steam generators.

Cause

1. The 4-inch level control valve is too large for stable flow control at low flow and intermediate steam generator pressure.

2. Pressure control instrumentation was driven off scale with pump not running causing slow response time during pump start.

3. The 4-inch level control valve is not designed to close against high differential pressure.

Corrective Actions

The flow control logic is being modified under DCN W-32189 with a split range operation for the LCVs. This design change resolves the three causes as follows:

1. The 4-inch LCV is used only when level demand calls for high flow rates, thus eliminating attempts to control low flows with a large valve.

2. The differential pressure transmitter is being respanned for full range (0-1650 psig) thus eliminating the saturation problem.

3. The sequence of closure assures the 4-inch valve closes with the 2-inch valve open. This eliminates the large differential pressure that prevented closure of the 4-inch valve.

These changes are being field worked and will be completed in support of Integrated Safeguards Testing.

Test Status

Low pressure testing will be performed during integrated safeguards testing to determine proper response time. In addition, the control system response will be tested over the expected range of operation at high, medium, and low steam generator pressures during the next heatup.

F.1 PRESSURIZER PRESSURE CONTROL - CODE SAFETY VALVES

Problem - One valve (1-RFV-68-563) leaked slightly during initial heatup. One valve (1-RFV-68-564) lifted prematurely at 2420 psig.

Cause

WBN's procurement specification for testing the safety valves did not specify either leakage test acceptance criteria or ambient temperatures to use when setting the valves. As a result, the vendor set the valves at an ambient temperature of 70°F instead of the approximately 130°F typically seen in the pressurizer enclosure. The vendor leak tested the valves at 92 percent of pressure set point instead of 95 percent.

Leakage of valve 68-563 occurred during a sharp temperature rise in the pressurizer enclosure due to taking one of three CRDM coolers out of service. Thus, two probable causes of leakage from 1-RFV-68-563 were the performance of the leak rate test at 92 percent instead of 95 percent and the temperature transient in the pressurizer enclosure during RCS heatup.

The probable cause for the lift of valve 68-564 was due to the low ambient temperature conditions used when setting the valve's relief pressure. The lift of valve 68-564 occurred when RCS pressure was very close (2 percent) to the valve's design set pressure. The valves are considered to be materially in good working order.

Corrective Actions

A Trevitest was performed that showed that the relief pressure setting was low on each of the 3 valves. The set pressures were raised and HFT continued. Valve 68-564 has been removed and will be sent to the vendor for disassembly, inspection, refurbishment, and setting.

The vendor contract has been revised to specify a 95 percent leakage criteria and appropriate ambient environmental conditions for setpoint calibration.

WBN's 3 spare safety valves will be modified with the Flexidisc II design (Flexidisc II modification had been made previously to safeties tested during HFT). These spares and valve 1-RFV-68-564 will be calibrated/leak-tested per the revised contract specifications. In addition, any improvements needed as a result of the inspection of 1-RFV-68-564 will be assessed for the spare valves. The three spare valves will be installed in support of the next heatup. The three valves tested during HFT will not be used at this time.

The WBN RCS system description will be revised to include guidance for RCS pressure hold time (to allow safety valve temperature stabilization) and provide limits on RCS heatup rate. Training will be provided to operators on the effects of changing the alignment of lower compartment coolers and actions to take in stopping leakage from a safety valve through RCS manipulations. Experience from SQN will be used as a basis for determining what is effective.

Test Status

The safety valves will be monitored during the next heatup.

F.2 PRESSURIZER PRESSURE CONTROL

Problem

Control functions were not occurring at the expected pressure. Control functions at various pressures were not repeatable.

Cause

TVA agrees with the NRC's analysis of the pressurizer pressure control test with the exception of the staff's conclusion that the determination of acceptable test results was made subjectively. The data collected during the preoperational test were sufficient to confirm that the test objectives and acceptance criteria were satisfied. Namely, the test demonstrated proper operation of the pressure control system in restoring and stabilizing RCS pressure in response to an initiated pressure transient. However, portions of the test were in error or insufficient for evaluating the range of response for specific components (e.g., heaters, spray valves). These weaknesses resulted from insufficient emphasis on instrument and control issues during the development and review of the draft preoperational test.

In addition, although pressurizer control instruments had been calibrated prior to HFT, some components were found to be outside of their calibration tolerances during HFT resulting in some control functions not occurring at their expected pressure. These instruments required calibration/tuning under process conditions to achieve the expected results.

Corrective Actions

Pressurizer pressure control instruments were calibrated/tuned and successfully retested during HFT. A qualitative evaluation of the data collected during the test found that control functions were adequately demonstrated and that test objectives and acceptance criteria were satisfied. In addition, following HFT, a full control loop test of the pressurizer pressure control circuit was performed with successful results. As described in discussions with the staff and in several letters, TVA has implemented a number of initiatives to improve the technical quality of preoperational tests during and since HFT. These measures have included more thorough reviews in specific technical disciplines and have resulted in improved tests.

Test Status

The control system will be observed during the next RCS heatup activity.

G.1 REACTOR COOLANT PUMP OPERATION - VIBRATION

Problem

Vibration levels were in the alert range with spiking and changing magnitudes.

Cause

WBN reactor coolant pumps behaved with similar characteristics and trends observed during previous hot functional testing and similar to other Westinghouse plants. The pumps are balanced at low temperatures and pressures. As the RCS temperatures and pressures are increased, the vibration may change. Vibration is monitored during heatup and pressurization to ensure that pumps do not operate at dangerous levels. Once the system reaches normal operating temperatures and pressures, the pumps are balanced for optimum conditions. For example, at WBN, RCPs 1 and 2 show increases in vibration amplitudes as the plant conditions approach operating temperatures and pressures, and RCP 4 shows a decrease in vibration amplitudes. These three pumps required trim balancing during HFT.

Corrective Actions

WBN will adjust the balance on RCP 2 by removing a calculated amount of balancing weights at the start of the next heatup. RCPs 1 and 4 may have additional physical work done to correct for any misalignment, and if so, balancing will need to be done only after continued monitoring reveals the new characteristics of the pumps. These actions will be completed during the next heatup.

Test Status

The RCP vibration levels will be monitored and the pumps rebalanced, as required, during the next heatup.

G.2 REACTOR COOLANT PUMP OPERATION - RCP OIL ANALYSIS

Problem

During Hot Functional Testing, oil samples were taken for each RCP motor as part of the baseline oil analysis on May 11, May 18, and June 7, 1994 (See Table 1). The results for the lower motor bearing when compared with other utilities indicated that lead concentrations appeared to be high.

Cause

During HFT, discussions with Westinghouse were inconclusive noting that the lead could be a result of lead oxidation from the amount of pump idle time or from solder joints on the oil cooler. In addition, Westinghouse and industry available data is based on samples taken with idle motors due to exposure concerns for sampling performed at operation. The WBN data was obtained while the pumps were in operation and would be expected to be higher. Industry data was not available for samples taken during pump operation.

Corrective Action

TVA will perform a swing check on each lower motor bearing to determine whether motor bearing inspections or other actions are necessary. In addition, the oil will be changed in each lower motor bearing and the oil reservoir will be flushed. These actions will be taken prior to the next heatup.

Test Status

Oil lead concentrations will be monitored periodically during the next heatup.

TABLE 1 - RCP MOTOR BEARING LEAD CONCENTRATION

DATE	UNIQUE ID	INBOARD (IB), OUTBOARD (OB)	LEAD (PPM)
05/18/94	(RCP-1) 1-MTR-068-0008	IB	64
05/26/94	(RCP-1) 1-MTR-068-0008	IB	67
06/07/94	(RCP-1) 1-MTR-068-0008	IB	67
05/18/94	(RCP-1) 1-MTR-068-0008	OB	0
05/11/94	(RCP-2) 1-MTR-068-0031	IB	81
05/26/94	(RCP-2) 1-MTR-068-0031	IB	86
06/07/94	(RCP-2) 1-MTR-068-0031	IB	81
05/11/94	(RCP-2) 1-MTR-068-0031	OB	0
05/18/94	(RCP-3) 1-MTR-068-0050	IB	11
05/26/94	(RCP-3) 1-MTR-068-0050	IB	55
06/07/94	(RCP-3) 1-MTR-068-0050	IB	52
05/18/94	(RCP-3) 1-MTR-068-0050	OB	0
05/11/94	(RCP-4) 1-MTR-068-0073	IB	40
05/26/94	(RCP-4) 1-MTR-068-0073	IB	58
06/07/94	(RCP-4) 1-MTR-068-0073	IB	48
05/11/94	(RCP-4) 1-MTR-068-0073	OB	0

H. RVLIS/INADEQUATE CORE COOLING MONITOR

During performance of PTI-68-10, Revision 1, five thermocouples indicated that a problem existed. These thermocouples have been repaired and will be retested during the January 1995 heatup. The RTDs will undergo cross-calibration during the January 1995 heatup.

TVA concurs with the staff's assessment of additional testing required for RVLIS post-core load.

I. SHUTDOWN FROM OUTSIDE THE MAIN CONTROL ROOM

AFW flow control - AFW flow control issues are being addressed as described in Item (E) above. The control scheme change will address operation from both the main and auxiliary control panels.

Pressurizer Cooldown Limits - PTI-68-13 (Shutdown from Outside the Main Control Room) utilized Abnormal Operating Instruction AOI-27 for abandonment of the MCR. This procedure is being replaced by a new procedure, AOI-30.2 "Fire Safe Shutdown - 10 CFR 50 Appendix R." To address the issue of pressurizer cooldown limits, AOI-30.2 will provide guidance for monitoring pressurizer temperature on cooldown, ensure steam tables and the PTLR curve are available in the auxiliary control room (ACR), and ensure sufficient data sheets are available to monitor the cooldown. This procedure will be issued prior to fuel load. Design changes are not considered necessary.

RHR Pump Suction Valve - This issue resulted from the associated pressure switch experiencing slight drift out of calibration. The pressure switch has been recalibrated and will be tested along with the suction valve during operation of the RHR System during the next heatup.

Component Cooling System Temperature - For approximately seven minutes, CCS temperatures exceeded procedural limits. The condition resulted from delaying the opening of the ERCW full flow control valve for the CCS heat exchanger. Once the full flow valve was opened, the temperature returned to normal. Engineering calculations confirm that CCS temperatures will be acceptable during shutdown from the ACR when ERCW flow is controlled through the full flow valve. The ERCW and CCS system description documents provide sufficient guidance for Operations for this condition. AOI-30.2 (discussed above) will provide appropriate measures to prevent exceeding CCS temperature limits. Design changes are not considered necessary.

Steam Generator PORV Controller - This issue resulted from insufficient calibration of a PORV controller. The controller has been recalibrated and all four PORV controllers will be retested during the next heatup.

Equipment Control Transfers - AOI-27 contained some errors in equipment nomenclature associated with required control switch transfers between the MCR and the ACR and local station. Although the errors in AOI-27 should have been detected prior to its use in a supporting role for the preoperational test, it was scheduled to be cancelled. Accordingly, it had not been upgraded or verified/validated as will be done for its planned replacement procedure, AOI-30.2. The specific transfer problems were resolved during test performance. Requirements for abandonment of the MCR, including accurate transfer controls, will be addressed in WBN procedure AOI-30.2. This procedure will be issued prior to fuel load.

J. **POST ACCIDENT SAMPLING SYSTEM**

TVA concurs with the staff's assessment of additional testing required for this system. The remaining preoperational testing for the PASS includes verification of containment sump and containment air samples. This testing will be performed prior to the next heatup.

TVA's response to the issues involved with testing PTI-043-01, Post Accident Sampling System was provided in our letter of August 13, 1994, in response to Notice of Violation 50-390/94-43-01. TVA's response noted the violation resulted from an isolated personnel error on the part of the test director in not recognizing that the subject test performance issues met the intent of a test deficiency. In addition, the response committed to perform a retest of appropriate portions of the test which would involve the use of plant chemistry personnel. The NRC documented its evaluation and acceptance of our response in a letter dated August 24, 1994. TVA believes that suitable actions have been completed to prevent recurrence of similar violations.

K. **MISCELLANEOUS VALVES**

SI CHECK VALVE EXCESS BACK LEAKAGE - Check valve 1-CKV-63-555 which had excessive back leakage during HFT has been repaired. A retest will be performed during the next HFT heatup.

RHR CROSS-TIE VALVE NOT OPEN/THERMAL BINDING - As a result of MOVATS testing of the RHR cross tie valves, TVA initiated WBPER940335 to document the condition and ensure appropriate corrective actions are taken. Corrective actions include drilling a hole in the upstream disc of each valve to prevent pressure locking from occurring. The review of the event determined that thermally induced pressure locking could occur when transitioning from Mode 4 to Mode 3. The review also confirmed that thermal binding or thermally induced pressure locking would not occur in the situation where the valves must move to support accident mitigation. A DCN has been initiated to drill the discs. Modifications will be completed and the valves tested during the next heatup.

STEAM DUMP VALVES RESPONSE TIME NOT MET - As a result of the stroke time testing of the steam dump valves, TVA revised the Main Steam System Description to document the acceptance of the longer stroke times via DCN S-31271. The Reactor Coolant System Description was revised to provide limits on moderator temperature coefficients to ensure the steam dump capacity of 40 percent of full load could be maintained without a reactor trip. The dynamic test for these valves during the power ascension test program is described in WBN's FSAR, Table 14.2-2.

ONE S/G SAFETY VALVE NOT TESTED PER CODE REQUIREMENTS - During testing of Main Steam Safety Valve (MSSV) 1-SFV-001-0528, the 10-minute wait period requirement was not met before performing the final valve test. The wait period was only 7 minutes. This was the last valve test before completion of testing. Testing was being performed by Fermanite personnel to their QA program under WBN work order WO 94-10576-03. The error apparently resulted from inattention to detail and is considered to be fatigue related. No other valve tests failed to meet this 10-minute wait period requirement. The failure to meet the 10-minute wait requirement was discovered during review of the work order prior to ending HFT. Work request WR 177128 was initiated to schedule testing of 1-SFV-001-528 during initial heatup post fuel load per Technical Specifications surveillance requirements.

L. MISCELLANEOUS PROBLEMS

CCP 1A-A VIBRATION - The vibration resulted from insufficient consideration of pedestal stiffness during a previous pedestal modification to allow access to welds. Modifications for this pump assembly were performed under DCN W-32406 to increase the pump pedestal stiffness. Vibration testing was performed in mid-October 1994. The results of the test indicate satisfactory operation.

TURBINE AND AUXILIARIES (LEAKS, VALVE FAILURES, ETC.) - Main turbine EHC operated valves are being refurbished and O-Rings replaced. In addition, the EHC system will be flushed in accordance with Vendor Technical Manual Requirements. These actions will be completed prior to the January 1995 heatup. The mechanical overspeed trip will be reset and retested during the next heatup or during power ascension test activities.

RESOLUTION OF PORV STROKE TIMES - The System Description for Main Steam is being revised under DCN-32708-A to provide clarification for the testing requirements for the PORVs. The maximum allowable stroke time had been 20 seconds. Westinghouse letter WAT-D-9736 indicates the PORVs are not modeled for the LOCA, Non-LOCA, Containment Integrity or the Operational Transient analyses and, therefore, are not affected by an increase in the automatic opening times. Therefore, the revision to the system description will indicate a 30-second opening stroke time for the PORVs per the test results of PTI-001-02. This revision will be completed prior to the next heatup.

BORIC ACID PUMP (HEAD FLOW PROBLEMS) - The boric acid transfer pump flow test results were evaluated and determined to be acceptable. The CVCS System Description was revised under DCN S-31224 to document the acceptance of the test results.

POOR TARGET ROCK VALVE PERFORMANCE - The PASS valves were reworked during HFT with Vendor assistance to correct leakage problems. These valves have been satisfactorily leak-tested during post-maintenance. The steam generator blowdown valves experienced position problems and excessive leak-through. These valves will be refurbished and retested during the next heatup. Following reed switch adjustment, the head vent valves performed satisfactorily during HFT.

PASS TESTING FOR RHR RETEST - This testing will be accomplished during the next heatup.

REPLACEMENT OF EAGLE 21 RACK CONNECTORS - Immediately following testing activities requiring the use of Rack 13, the cable assembly including the connectors were replaced. Discussion with Westinghouse indicates that loose connectors are not a common problem. It appears that the amount of cleaning and manipulation of connectors in support of testing contributed to the condition of Rack 13. Other examples of this issue have not been observed. As work in these areas and testing is completed, manipulation of connectors will be unnecessary and further loose connectors should not occur. Rack 13 is currently functioning properly.

STANDBY MOTOR DRIVEN FEEDWATER PUMP AND LUBE OIL PUMP VIBRATION - For the Standby MDFP, vibration existed in the alert range during most of HFT. The vibration had been anticipated due to the low flow conditions imposed by the HFT limited heat sink. Vibration amplitudes were high on the pump as a result of mini-flow conditions. Acceptability of these vibration levels under low flow conditions will be evaluated prior to the next heatup. For the lube oil pump, the bearings were replaced and the overall vibration levels are acceptable.

SOURCE RANGE INSTRUMENTATION EXHIBITED HIGH NOISE LEVELS - The nuclear instrumentation backup source range channel calibrations could not be successfully completed prior to the start of HFT due to an indication of 700 to 900 counts per second (CPS) on the monitors. Normal levels of near zero CPS would be expected since no neutron activity was present near the detector. Electrical noise on the signal wiring is the expected problem. Prior to and during the HFT heatup, considerable trouble shooting had been performed to determine the source of noise until HFT environmental conditions limited access to the work area. The two normal source range channels exhibited appropriate indications of near zero CPS. Evaluation and correction of the noise levels will be resolved prior to the next heatup.

ENCLOSURE 2

SUMMARY OF COMMITMENTS

The following modifications and repairs will be completed prior to the next heatup unless otherwise noted. Referenced pages provide additional detail:

1. TDAFW System (DCN-30930) and correction of steam leaks (Page A-1).

2. TDAFW level control valves (DCN-31275) (Page A-2).

3. Appendix-R Modification for valve 1-FCV-62-93 (Page A-8).

4. MDAFW level control valves (DCN W-32189, Page A-9) will be complete in support of integrated safeguards testing.

5. Pressurizer Safeties (Page A-10): Safety valve 1-68-564 has been removed and will be sent to Crosby for disassembly, inspection, refurbishment, and setting. WBN's 3 spare safety valves will be modified with the Flexidisc II design. Any improvements needed as a result of the inspection of 1-RFV-68-564 will be assessed for the spare valves. These spares and valve 1-RFV-68-564 will be calibrated/leak-tested per the revised contract specifications. The spare valves will be installed in support of the next heatup.

6. RCPs (Vibration) (Page A-12): The balance for RCP 2 will be adjusted. Balancing may be required for RCPs 1 and 4. Complete during start of next heatup.

7. RCPs (Oil analysis) (Page A-13): Perform a swing check on each lower motor bearing, change oil in each lower motor bearing, and flush oil reservoir, prior to heatup.

8. RHR Cross-tie Valve (Page A-16): Drill hole in upstream disc of each valve.

9. Turbine EHC valves to be refurbished and O-rings replaced. EHC system will be flushed in accordance with vendor requirements (Page A-17).

10. Steam Generator Target Rock Blowdown valves will be refurbished (Page A-18).

11. The acceptability of MDFWP vibrations under low flow conditions will be evaluated prior to the next heatup (Page A-18).

12. Backup Source Range Channel noise will be resolved (Page A-18).

ENCLOSURE 2

SUMMARY OF COMMITMENTS (CONTINUED)

The following retests will be performed prior to or during the next heatup unless otherwise noted.

1. Retest of TDAFW System endurance and reliability (Page A-1).

2. Retest of TDAFW level control valve stroke times will be performed in support of the next heatup (Page A-2).

3. Retest of RHR Pump 1B-B (Page A-4).

4. During the next heatup, the CVCS PDP speed controller will be retested, the PDP vibration will be monitored, and the accumulators will be observed (Page A-5).

5. Perform post-modification test for valve 1-FCV-62-93 prior to the next heatup (Page A-8).

6. MDAFW Level Control valves (Page A-9): Low pressure testing will be performed during integrated safeguards testing to determine proper response time. Control system response will be tested over the expected range of operation during the next heatup.

7. Pressurizer safeties will be monitored during the next heatup (Page A-10).

8. Pressurizer pressure control system will be observed during the next heatup (Page A-11).

9. RCP vibration levels will be monitored and the pumps rebalanced, as required, during the next heatup (Page A-12).

10. RCP Oil lead concentrations will be monitored periodically during the next heatup (Page A-13).

11. Incore thermocouples will be retested during the next heatup (Page A-15).

12. RTDs will undergo cross-calibration during the next heatup (Page A-15).

13. The RHR pump suction valve and associated pressure switch will be retested during heatup (Page A-15).

14. The four steam generator PORV controllers will be retested during heatup (Page A-15).

15. PASS retest will be performed prior to the next heatup (Page A-16).

16. Check valve 1-CKV-63-555 will be retested during the next heatup (Page A-16).

ENCLOSURE 2

SUMMARY OF COMMITMENTS (CONTINUED)

17. RHR cross-tie valve will be tested during the next heatup (Page A-16).

18. Main Steam Safety Valve (MSSV) 1-SFV-001-0528 will be tested during initial heatup post fuel load per Technical Specification surveillance requirements (Page A-17).

19. The main turbine mechanical overspeed trip will be reset and retested during the next heatup or during power ascension test activities (Page A-17).

20. Steam generator target rock blowdown valves will be retested during the next heatup (Page A-18).

21. PASS testing for the Train B RHR system will be tested during the next heatup (Page A-18).

The following summarizes the non-hardware commitments made in this submittal:

1. TVA is developing a readiness plan for the January 1994 heatup which will be made available to the staff (Page 1).

2. TVA is addressing lessons learned from the previous test program (1983 timeframe) for upcoming major preoperational tests. This will involve evaluation of previous test procedures and results to determine potential impacts on current testing. The review will include the following elements: (1) Identify acceptance criteria changes which may precipitate test deficiencies, (2) Identify potential recurrent test deficiencies, and (3) Identify major equipment modifications which could precipitate test deficiencies. These reviews will be performed for the following tests: Integrated Safeguards, EGTS, ABGTS, and Main Control Room Pressurization (Page 6).

3. The use of dedicated problem solvers in Nuclear Engineering and Startup and Test will be continued, as required, for the remainder of the preoperational test program (Page 5).

4. WBN Operations will be responsible for controlling the plant, including utilizing approved, upgraded procedures to the extent possible during the next heatup. TOPs will be upgraded consistent with current design in support of heatup (Pages 5, 8).

5. Permanent plant operating procedures will be revised prior to the next heatup to improve filling and venting of the RHR System (Page A-4).

ENCLOSURE 2

SUMMARY OF COMMITMENTS (CONTINUED)

6. Requirements and precautions will be added to the operating procedures for the CVCS positive displacement pump to address (a) mini-flow operations during pump starts, (b) venting of the pump and suction/discharge accumulators prior to starting pump, and (c) periodic checks of the suction/discharge accumulators (Page A-5).

7. The WBN RCS system description will be revised to include guidance for RCS pressure hold time (to allow safety valve temperature stabilization) and provide limits on RCS heatup rate (Page A-10).

8. Training will be provided to operators on the effects of changing the alignment of lower compartment coolers and actions to take in stopping leakage from a safety valve through RCS manipulations. Experience from SQN will be used as a basis for determining what is effective (Page A-10).

9. Operations will address the following items in AOI-30.2 which will be issued prior to fuel load: (1) provide guidance for monitoring pressurizer temperature on cooldown, (2) ensure steam tables and the PTLR curve are available in the auxiliary control room (ACR), (3) ensure sufficient data sheets are available to monitor the cooldown, (4) ensure appropriate identification of control switch transfers between the MCR and the ACR, and (5) provide appropriate measures to prevent exceeding CCS temperature limits (Pages A-15, 16).

10. The System Description for Main Steam is being revised under DCN-32708-A to indicate a 30-second opening stroke time for the PORVs per the test results of PTI-001-02. This revision will be completed prior to the next heatup (Page A-17).