



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

TVA-WBN-TS-98-007

10 CFR 50.90

**AUG 06 1998**

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

Gentlemen:

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

**WATTS BAR NUCLEAR PLANT (WBN) - UNIT 1 - TECHNICAL  
SPECIFICATION (TS) CHANGE NO. 98-007 - CLARIFICATION OF  
SURVEILLANCE TESTING REQUIREMENTS FOR THE TURBINE DRIVEN  
AUXILIARY FEEDWATER PUMP (TDAFWP)**

In accordance with the provisions of 10 CFR 50.90, TVA is submitting a request for an amendment to WBN's license NPF-90 to change the TS for Unit 1. The proposed amendment would revise the Watts Bar Nuclear Plant (WBN) TS and associated TS Bases to clarify the intent of the surveillance testing requirements for the turbine driven auxiliary feedwater pump (TDAFWP).

TVA has determined that there are no significant hazards considerations associated with the proposed change and that the change is exempt from environmental review pursuant to the provisions of 10 CFR 51.22(c)(9). The WBN Plant Operations Review Committee and the WBN Nuclear Safety Review Board have reviewed this proposed change and determined that operation of WBN Unit 1 in accordance with the proposed change will not endanger the health and safety of the public.

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Enclosure 1 to this letter provides the description and evaluation of the proposed change including TVA's determination that the proposed change does not involve a significant hazards consideration, and is exempt from environmental review. Enclosure 2 contains copies of the appropriate TS pages from Unit 1 marked-up to show the proposed change. Enclosure 3 forwards the revised TS pages for Unit 1 which incorporate the proposed change.

TVA requests that NRC approval be approximately 30 days prior to beginning WBN's refueling outage currently scheduled for early 1999, and that the revised TS be made effective within 30 days of NRC approval.

In accordance with 10 CFR 50.91(b)(1), TVA is sending a copy of this letter and enclosures to the Tennessee State Department of Public Health.

If you have any questions about this change, please contact me at (423) 365-1824.

Sincerely,



P. L. Pace  
Licensing & Industry Affairs Manager

Enclosures

cc: See page 3

Subscribed and sworn to before me  
on this 6th day of August, 1998.

E. Jeannette Long  
Notary Public

My Commission Expires

June 27, 2001

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cc (Enclosures):

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ENCLOSURE 1

TENNESSEE VALLEY AUTHORITY  
WATTS BAR NUCLEAR PLANT (WBN)  
UNIT 1  
DOCKET NO. 50-390

PROPOSED TECHNICAL SPECIFICATION (TS) CHANGE TS-98-007  
DESCRIPTION AND EVALUATION OF THE PROPOSED CHANGE

I. DESCRIPTION OF THE PROPOSED CHANGE

The proposed amendment would revise the Watts Bar Nuclear Plant (WBN) TS and associated TS Bases to clarify the intent of the surveillance requirements (SRs) for the turbine driven auxiliary feedwater pump (TDAFWP). The requirements for pump performance testing including capability to develop the required head (SR 3.7.5.2), automatic start capability (SR 3.7.5.4), and response time testing (SR 3.3.2.10) were intended to be performed no later than 24 hours after Steam Generator pressure is  $\geq$  1092 psig to ensure sufficient steam pressure is available. However, a NOTE in each of the above SRs differs from the Westinghouse Standard MERITS Technical Specifications (NUREG 1431, Revision 1) by inadvertently precluding testing until SG pressure achieves 1092 psig. Under certain plant conditions, sufficient steam pressure to adequately test the TDAFWP may exist below 1092 psig.

Specifically, the following changes are being proposed as illustrated by the markup provided in Enclosure 2:

1. Revise the NOTE for SRs 3.7.5.2, 3.7.5.4, and 3.3.2.10 from:

"Required to be performed for the turbine driven AFW pump within 24 hours after SG pressure is  $\geq$  1092 psig."

to:

"Not required to be performed for the turbine driven AFW pump until 24 hours after  $\geq$  1092 psig in the steam generator."

2. The TS BASES for SRs 3.7.5.2, 3.7.5.4, and 3.3.2.10 would be revised accordingly.

## II. REASON FOR THE PROPOSED CHANGE

The proposed amendment restores the subject TDAFWP TS surveillance requirements to be consistent with the wording and intent of the current Westinghouse MERITS TS, NUREG 1431, Revision 1. The requirements for pump performance testing including capability to develop the required head (SR 3.7.5.2), automatic start capability (SR 3.7.5.4), and response time testing (SR 3.3.2.10) were intended to be performed no later than 24 hours after Steam Generator pressure is  $\geq$  1092 psig (normal operating pressure at no-load conditions) to ensure sufficient steam pressure is available. In early 1995, prior to initial licensing of WBN Unit 1, the subject NOTE for the TDAFWP draft TS was consistent with the proposed wording herein. However, in July 1995, WBN personnel were concerned that the TS could be incorrectly interpreted to allow a 24-hour delay prior to beginning the test and submitted a modification to the final draft TS resulting in the current wording. In so doing, the TS has inadvertently been made more restrictive than NUREG-1431, Revision 1. Under the current TS wording, unnecessary delays or repetitive testing may be encountered during heatup following a refueling outage due to waiting for steam generator pressure to stabilize at normal operating temperature and pressure. The proposed amendment addresses this condition by allowing performance of the affected SRs at suitable plant conditions, and thereby maximizing the time available to take required corrective actions in the event pump degradation is discovered during testing.

## III. SAFETY ANALYSIS

The safety-related Auxiliary Feedwater (AFW) system supplies feedwater to the steam generators (SG) in the event of a loss of main feedwater to remove reactor decay heat and avoid Reactor Coolant System overpressurization. The AFW system is not required during normal plant operation. The system consists of two motor driven pumps (MDAFWPs) and one turbine driven pump (TDAFWP) and associated level control valves (LCVs). Steam is supplied to the TDAFWP from SG 1 (normal) or SG 4 (backup). The TDAFWP is a 6 stage centrifugal pump manufactured by Ingersoll-Rand to ASME Section III, Class 3 requirements and is "N" stamped. The TDAFWP is a split-casing pump designed to start from cold conditions to rated conditions within 15 seconds and is designed to handle water from 40°F to 120°F. The TDAFWP is powered by a single stage impulse, noncondensing backpressure steam turbine manufactured by Terry Turbine. The TDAFWP speed controller maintains the speed from a rated low speed of 2076 rpm up to a rated high speed of 3950 rpm.

The limiting design basis accidents and transients for the AFW system are a Loss of Normal Main Feedwater (LONF) and a Main Feedwater Line Break, combined with a loss of offsite power following turbine trip. The design basis accidents are described in detail in the WBN FSAR Accident Analyses, Chapter 15. The accident analyses takes credit, in most cases, for the TDAFWP reaching full rated speed and flow (greater than 720 gpm) within 60 seconds, pumping into intact steam generators at the maximum safety valve lift pressure of approximately 1257 psig (includes 3% setpoint drift, and 3% accumulation). The primary safety function (considering a loss of normal feedwater) is to initially remove residual heat from the SGs and the RCS, and then remove decay heat from the primary side and thereby prevent RCS overpressurization.

The requirements for pump performance testing including capability to develop the required head (SR 3.7.5.2), automatic start capability (SR 3.7.5.4), and response time testing (SR 3.3.2.10) were intended to be performed no later than 24 hours after Steam Generator pressure is  $\geq 1092$  psig to ensure sufficient steam pressure is available. The proposed license amendment would clarify the WBN TS requirements for TDAFW pump performance testing, by allowing performance of the SRs at suitable plant conditions during which steam generator pressure may be less than the no-load steam generator pressure of 1092 psig. As discussed herein, this approach is consistent with the intent of the Standard MERITS TS and with the WBN accident analyses.

The following discusses relevant considerations for the proposed TS change and concludes that adequate testing of the TDAFWP may be performed at less than a SG pressure of 1092 psig with no adverse impact on the safe operation of WBN. Note that the use of typical numerical values for parameters such as pressure, flowrate, RPM, etc., are provided to facilitate the discussion and are not intended to prescribe requirements or limitations unless indicated.

SR 3.7.5.2 - Verify developed head of AFW pump is greater than or equal to required head.

As discussed in the Bases for the current TS, performance of this quarterly ASME Section XI test ensures that TDAFW pump performance has not degraded by confirming one point on the pump design curve which is indicative of overall performance. Because it is undesirable to introduce cold AFW into the SGs while they are operating, this testing is performed on recirculation flow of approximately 50 gpm. This places the pump at or near deadhead on the pump curve thus developing the maximum pump head at the test rpm. Actual acceptable pump pressures would range from approximately 1260 to 1460 psig based on the current test requirements.

The literal interpretation of the current TS wording for the subject NOTE unnecessarily precludes performance of this test below the no-load SG pressure of 1092 psig. Although optimum test results may be obtained at SG pressure of 1092 psig; depending on plant conditions, satisfactory performance of this test may be accomplished at SG pressures less than 1092 psig. The Ingersoll-Rand pump curve for the TDAFWP indicates the horsepower required at deadhead conditions is approximately 600 HP; at the runout position, the required power is approximately 1200 HP. Performance data obtained from the TDAFWP steam turbine vendor, Terry Turbine, indicate that at approximately 3950 rpm (full rated TDAFWP speed), the required inlet steam pressure to the turbine to develop 600 HP is approximately 445 psig (at 26,000 lb/hr) and approximately 875 psig (at 50,000 lb/hr) to develop 1200 HP. Therefore, at SG pressures less than 1092 psig, the Terry Turbine data indicate an adequate test pressure should be achievable to demonstrate pump performance and ability to perform the safety grade functions required to mitigate the design basis accidents.

SR 3.7.5.4 - Automatic AFW pump start on an actual or simulated actuation signal.

Performance of this test only requires sufficient pressure to actuate the TDAFW pump and would be acceptable under the minimum pressure conditions discussed above for SR 3.7.5.2.

SR 3.3.2.10 - TDAFW Pump Response Time Test

The requirement for ESFAS response time testing for the turbine driven AFW pump is the time from accident signal initiation to pump achieving full flow to the steam generator. As discussed earlier, full flow testing to the steam generator is not desirable, thus the test is performed in the recirculation mode. During the initial preoperational pump response time testing, response time test data was obtained for both (1) the time for pump to achieve full flow to the steam generator, and (2) the time for pump to reach a steady state discharge pressure in the recirculation mode. The recirculation mode response time was subtracted from the full flow response time to create a "fixed factor" which is added to the recirculation mode response time obtained in any subsequent performance. This combined (fixed factor plus response time on recirculation flow) pump response time is then compared to the allowable pump response time for surveillance testing purposes. Changes to the AFW system flow/pressure characteristics are evaluated to determine whether new baseline test data is needed. Thus, the requirement for ESFAS response time testing under SR 3.3.2.10 is that the pump be able to achieve normal steady state discharge pressure while in the recirculation mode. Therefore, the minimum steam generator pressures required to achieve pump normal discharge flow and pressure in the recirculation mode (as discussed above for SR 3.7.5.2) would be sufficient for response time testing of the TDAFWP.

### Single Failure Considerations:

The AFW design specifies that the minimum flow rate requirements be met by the AFW system for the limiting design basis accidents and transients even if the worst case single failure occurs simultaneously. The active failures considered include:

- AC power train failure
- TDAFWP failure
- MDAFWP failure
- Pressure control valve failure (runout protection for the MDAFWP)
- Level control valve failures (TDAFWP and MDAFWP)
- Pressure switch failures
- AFW check valve failures (fail to close on reverse flow)
- Flow controller failure (runout protection for the TDAFWP)

The above credible failure modes have been evaluated and remain unchanged by this TS change. Therefore, no new equipment failure modes are introduced that would prevent the AFW system from performing its safety functions and equipment failure would not cause any new or different kinds of accidents.

### System Performance Evaluation:

LCO 3.7.5 requires three AFW trains to be OPERABLE in MODE 3. Upon heatup from an outage (which may have involved TDAFWP maintenance), the TDAFWP is expected to be OPERABLE upon entering Mode 3. Confirmation of operability is provided in part by the subject SRs which are required to be performed once suitable test conditions exist. Thus, the current TS establish a range of Mode 3 temperature and pressure conditions under which the AFW system is designed and expected to be OPERABLE, even though testing may be incomplete or in progress to confirm operability. Since a discussion of every situation is impractical, the following examines typical considerations for pump testing below a SG pressure of 1092 psig:

The review was performed assuming the tests were performed at an example SG pressure of 450 psig saturated. This condition would exist early in Mode 3. The results of the review concludes that adequate testing of the TDAFWP may be performed at less than SG pressure of 1092 psig with no adverse impact on the test results or the safe operation of WBN. Some plant systems and considerations which interface with the TDAFWP test include:

- Main Steam System and Main Condenser - If testing was performed with the main steam isolation valves (MSIVs) open, the condenser steam dump valves would be available to automatically regulate SG pressure in the pressure control mode. Any effects of the test on RCS heat transfer would be minimal and controlled in the same manner as performed for the current test at 1092 psig. Performance of the test(s) while cooling the RCS using SG PORVs (MSIVs closed) could also be performed in a controlled manner with no adverse effects on the test or the RCS. In either case, plant heatup could continue with the test in progress.
- The moisture content of the steam at 450 psig saturated would be approximately equal to the moisture content at 1092 psig.
- As with testing at 1092 psig, condensed water in the steam piping leading to the turbine would be removed by drains and steam traps prior to initiation of the test at lower pressures.
- During performance of the test at the lower pressure, emergency features would remain available as required to support operability of the AFW System and the reactor protection system. The ERCW system would be available as emergency backup to the Condensate Storage Tank (CST) which is normally available and aligned to the AFW pumps. Additionally, whether at 1092 psig or 450 psig, the required TDAFWP safety grade start signals (Loss of Offsite Power, low-low SG level in two SGs, and a safety injection (SI) signal) are designed to override the test conditions and automatically realign the closed LCVs and start the TDAFWP and provide flow to the SGs. It is noted that permissive P-11 may be in place (Pressurizer pressure less than 1970 psig) when testing at 450 psig, which would block the SI signal generated by High Steam Pressure Rate, Low Steam Line Pressure, and Low Pressurizer Pressure. However, High Containment Pressure and manual actuation SI generated signals remain available.
- As with testing at 1092 psig, a start of the TDAFWP at lower pressures will automatically cause Steam Generator Blowdown isolation. (valves may be reopened after pump start if desired)
- AFW Check Valve Testing - Performance of the subject tests at lower steam generator pressures has no adverse effect on AFW check valve testing. Check valve tests which are currently performed during the pump performance test (SR 3.7.5.2) at 1092 psig would be adequately tested at the lower SG pressure. Example

check valves include stroke tests for: TDAFW pump suction check valve, TDAFW main steam supply check valves, TDAFW pump recirc check valve, and backseat tests of the MDAFW check valves. Under the current procedures, full flow testing of the TDAFW SG supply check valves would still be performed at 1092 psig to check for full flow capability.

- The difference in test pressure of 1092 psig versus 450 psig is not expected to affect the stroke time test of the Terry turbine trip and throttle valve, 1-FCV-1-51. Discussion with the vendor, Terry Turbine, indicates that due to the tightness of the DC motor gearing for this valve, its stroke time would be insignificantly affected by the lower pressure.
- The proposed TS change has no impact on the TDAFWP overspeed trip test which is performed with the turbine uncoupled from the TDAFWP with SG pressures of approximately 100 psig to 150 psig.

#### Summary

The proposed TS change has no adverse impact on the TDAFW test results or on the ability of plant safety systems to perform their intended function. The design basis accidents and anticipated operational transients which impose AFW system safety functions are not impacted by the proposed TS change. The existing accident analyses and operational characteristics remains unchanged due to the change in SG pressure at which the TDAFWP testing is performed. The frequency of the TDAFWP test remains unchanged and will continue to detect any performance degradation of the pump.

#### **IV. NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION**

TVA has concluded that operation of Watts Bar Nuclear Plant (WBN) Unit 1 in accordance with the proposed change to the technical specifications does not involve a significant hazards consideration. TVA's conclusion is based on its evaluation, in accordance with 10 CFR 50.91(a)(1), of the three standards set forth in 10 CFR 50.92(c).

- A. The proposed amendment does not involve a significant increase in the probability or consequences of an accident previously evaluated.**

The proposed license amendment would revise the subject TDAFWP TS surveillance requirements to be consistent with the intent of the current Westinghouse MERITS TS, NUREG 1431, Revision 1. TS 3.3.2 and 3.7.5 would be revised to permit testing of

the TDAFWP at SG pressures less than the no-load pressure of 1092 psig. Under these conditions, the AFW system will continue to satisfy requirements for the analyzed design basis accidents and anticipated operational transients dependent on AFW. The design basis for the AFW system and specifically the TDAFWP will be maintained such that the AFW system and its equipment will continue to perform its safety functions because the TDAFWP test will demonstrate, on recirculation flow near pump shutoff head, the ability to deliver full rated flow to the SGs. The proposed TS change does not result in any modifications to the plant and does not alter any fission barriers or challenge fuel integrity, nor are other safety systems degraded by the subject change. Potential radiological releases are not impacted by this TS change and there are no new release pathways created. Therefore, the proposed TS change does not involve a significant increase in the probability or consequences of an accident previously evaluated for WBN.

- B. The proposed amendment does not create the possibility of a new or different kind of accident from any accident previously evaluated.**

The proposed TS change does not result in a modification to the plant and has no adverse affect on the ability of any safety-related system to perform its intended function. No new accident scenarios are created and no new failure modes/mechanisms or limiting single failures are created as a result of the proposed change that would prevent the AFW system from performing its safety functions. A lower test pressure than the current value of 1092 psig would have an insignificant impact on the stroke time of the Terry turbine trip and throttle valve, 1-FCV-1-51. Therefore, the proposed TS change will not result in any new or different kind of accident from any accident previously evaluated.

- C. The proposed amendment does not involve a significant reduction in a margin of safety.**

This TS change does not change an acceptance limit nor does it reduce a margin of safety associated with the acceptance criteria for any WBN accident. The safety analyses performed for WBN is not based on the SG pressure at which the TDAFWP test is conducted. Specifically, the proposed TS change clarifies requirements for the TDAFW pump testing consistent with industry practice. The capability of the SRs to detect any degradation to the TDAFWP is unaffected. The capability of the SRs to demonstrate automatic start and adequate response

time of the TDAFWP is not adversely impacted. The test remains a requirement of the TS, but clarifies that the test may be conducted at a SG pressure less than no-load conditions. The proposed TS change does not reduce the margin of safety limits established to protect any fission product barriers. Therefore, the proposed TS change will not involve a significant reduction in a margin of safety.

V. ENVIRONMENTAL IMPACT CONSIDERATION

The proposed change does not involve a significant hazards consideration, a significant change in the types of or significant increase in the amounts of any effluents that may be released offsite, or a significant increase in individual or cumulative occupational radiation exposure. Therefore, the proposed change meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), an environmental assessment of the proposed change is not required.