UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

August 30, 2010

Mr. R. M. Krich
Vice President, Nuclear Licensing
Tennessee Valley Authority
3R Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

SUBJECT: WATTS BAR NUCLEAR PLANT, UNIT 1 - SAFETY EVALUATION OF RELIEF REQUEST PV-02, REVISION 1, FOR THE SECOND 10-YEAR INTERVAL OF THE INSERVICE TESTING PROGRAM (TAC NO. ME4204)

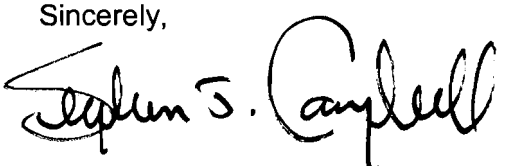
Dear Mr. Krich:

By letter dated July 1, 2010, as supplemented July 30, 2010, Tennessee Valley Authority (TVA) submitted Relief Request PV-02, Revision 1 that proposed an alternative to certain inservice testing (IST) requirements of the American Society of Mechanical Engineers *Code for Operation and Maintenance of Nuclear Power Plants* for Watts Bar Nuclear Plant (WBN), Unit 1. The relief request applies to the second 10-year IST interval that began on May 27, 2007, and will end on May 26, 2016. The subject relief request involves an inclusion of preservice testing requirements of ISTB-5210(a) in addition to the original relief request PV-02 authorized by letter dated March 9, 2007.

The U.S. Nuclear Regulatory Commission staff has completed its review of the subject relief request as documented in the enclosed Safety Evaluation (SE). Our SE concludes that: (1) compliance with the specified IST requirements would be impractical due to the need for significant system modifications; and (2) the proposed alternative provides reasonable assurance of the operational readiness of the subject essential raw cooling water screen wash pumps. The Nuclear Regulatory Commission staff further concludes that granting the relief is authorized by law and will not endanger life or property or the common defense and security and is otherwise in the public interest, giving due consideration to the burden upon TVA that could result if the requirements were imposed on WBN Unit 1. Therefore, pursuant to Section 50.55a(f)(6)(i) of Title 10 of the *Code of Federal Regulations*, the proposed alternative is authorized for WBN Unit 1. The proposed alternative is authorized for the second 10-year IST interval at WBN Unit 1.

If you have any questions concerning this matter, please contact the WBN Unit 1 Senior Project Manager, Mr. John G. Lamb, at (301) 415-3100.

Sincerely,



Stephen J. Campbell, Chief
Watts Bar Special Projects Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-390

Enclosure:
Safety Evaluation

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO RELIEF REQUEST PV-02, REVISION 1

FOR THE SECOND 10-YEAR INTERVAL OF THE INSERVICE TESTING PROGRAM

TENNESSEE VALLEY AUTHORITY

WATTS BAR NUCLEAR PLANT, UNIT 1

DOCKET NO. 50-390

1.0 INTRODUCTION

By letter dated July 1, 2010 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML101870600), the Tennessee Valley Authority (TVA) submitted Relief Request PV-02, Revision 1 to the U.S. Nuclear Regulatory Commission (NRC) for the second 10-year Inservice Testing (IST) program interval at Watts Bar Nuclear Plant (WBN), Unit 1. The WBN Unit 1 second 10-year IST program interval began on May 27, 2007, and ends on May 26, 2016. TVA requested relief for four essential raw cooling water (ERCW) screen wash pumps, from certain flow measurement requirements noted in the American Society of Mechanical Engineers (ASME) *Code for Operation and Maintenance of Nuclear Power Plants* (OM Code). In response to the NRC staff's request for additional information, dated July 15, 2010 (ADAMS Accession No. ML101950225), TVA submitted additional information in a letter dated July 30, 2010 (ADAMS Accession No. ML102160340).

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(f)(6)(i), TVA requested relief and to use alternative requirements for IST items (Request PV-02, Revision 1) on the basis that the Code requirement is impractical.

2.0 REGULATORY EVALUATION

Title10 of CFR 50.55a(f), "Inservice Testing Requirements," requires, in part, that IST of certain ASME Code Class 1, 2, and 3 pumps and valves be performed at 120-month (10-year) IST program intervals in accordance with the specified ASME Code and applicable addenda incorporated by reference in the regulations. Exceptions are allowed where alternatives have been authorized or relief has been requested by the licensee and granted by the NRC pursuant to paragraphs (a)(3)(i), (a)(3)(ii), or (f)(6)(i) of 10 CFR 50.55a. In proposing alternatives or requesting relief, the licensee must demonstrate that: (1) the proposed alternatives provide an acceptable level of quality and safety (10 CFR 50.55a(a)(3)(i)); (2) compliance would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety (10 CFR 50.55a(a)(3)(ii)); or (3) conformance is impractical for the facility (10 CFR 50.55a(f)(6)(i)). Section 50.55a allows the NRC to authorize alternatives and to grant relief from ASME OM Code requirements upon making necessary findings.

In accordance with 10 CFR 50.55a(f)(4)(ii), licensees are required to comply with the requirements of the latest edition and addenda of the ASME Code incorporated by reference in the regulations 12 months prior to the start of each 120-month IST program interval. In accordance with 10 CFR 50.55a(f)(4)(iv), IST of pumps and valves may meet the requirements set forth in subsequent editions and addenda that are incorporated by reference in 10 CFR 50.55a(b), subject to NRC approval. Portions of editions or addenda may be used provided that all related requirements of the respective editions and addenda are met. NRC guidance contained in Generic Letter (GL) 89-04, "Guidance on Developing Acceptable Inservice Testing Programs," provides alternatives to ASME Code requirements that are acceptable. Further guidance is given in GL 89-04, Supplement 1, and NUREG-1482 Revision 1, "Guidance for Inservice Testing at Nuclear Power Plants."

ASME OM code cases that are approved for use by the NRC are listed in Regulatory Guide (RG) 1.192, "Operation and Maintenance Code Case Acceptability, ASME OM Code" dated June 2003. The Code of Record for the WBN Unit 1 second 10-year IST program interval is ASME OM Code, 2001 Edition through 2003 Addenda, as required by 10 CFR 50.55a(f)(4)(ii).

The NRC's findings with respect to granting relief from the ASME OM Code are given below.

3.0 TECHNICAL EVALUATION

3.1 Relief Request PV-02, Revision 1

ISTB-5210(a), "Preservice Testing" (Vertical Line Shaft Centrifugal Pumps), states that "In systems where resistance can be varied, flow rate and differential pressure shall be measured at a minimum of five points. If practicable, these points shall be from pump minimum flow to at least pump design flow. A pump curve shall be established based upon the measured points. At least one point shall be designated as the reference point(s). Data taken at the reference point will be used to compare the results of inservice tests. A pump curve need not be established for pumps in systems where the resistance cannot be varied."

ISTB-5221(b), "Group A Test Procedure" (Inservice Testing) (Vertical Line Shaft Centrifugal Pumps), states that "The resistance of the system shall be varied until the flow rate equals the reference point. The differential pressure shall then be determined and compared to its reference value. Alternatively, the flow rate shall be varied until the differential pressure equals the reference point and the flow rate determined and compared to the reference flow rate value."

ISTB-5223(b), "Comprehensive Test Procedure" (Inservice Testing) (Vertical Line Shaft Centrifugal Pumps), states that "The resistance of the system shall be varied until the flow rate equals the reference point. The differential pressure shall then be determined and compared to its reference value. Alternatively, the flow rate shall be varied until the differential pressure equals the reference point and the flow rate determined and compared to the reference flow rate value."

TVA requested relief from the above Code paragraphs for the following pumps:

1-PMP-67-431-A	ERCW Screen Wash Pump
1-PMP-67-440-B	ERCW Screen Wash Pump
2-PMP-67-437-A	ERCW Screen Wash Pump
2-PMP-67-447-B	ERCW Screen Wash Pump

These ERCW screen wash pumps are vertical line shaft centrifugal pumps.

TVA notes the following:

> No in-line instrumentation exists to measure flow and the physical configuration of the ERCW screen wash pumps and piping does not allow the use of portable flow measuring equipment such as ultrasonic flow meters. Piping from the discharge of the screen wash pumps is open-ended to the spray nozzles at the traveling screen and is relatively short with multiple elbows, reducers, and valves in different planes. The physical configuration of this piping system is such that no portion of the piping meets the requirements for adequate installation of a permanent flow measuring device. Therefore, measured flow readings from an installed device may not be repeatable or representative of actual pump flow. Significant system modifications, such as piping rerouting and pipe support redesign, would be required to obtain a configuration that would provide reliable flow readings.
>
> Flow is not the critical parameter for these pumps. The nature of their operation is to ensure that sufficient pressure is maintained at the spray nozzles during flushing operations of the traveling water screens to ensure that sufficient force is exerted on the debris accumulated on the screen to remove it. This can be verified by testing the effectiveness of the flushing operation.
>
> The preservice, Group A, and comprehensive tests will be performed by setting the system resistance to the same point for each test with the throttle valves full open. Flow will not be measured. The remaining variable that could affect system resistance is the spray nozzles. The condition of the spray nozzles will be inspected during each test performance with corrective actions initiated as necessary, thus providing assurance that the spray nozzle condition will not affect flow rate. Maintenance history was reviewed for spray nozzle plugging and it was determined that nozzle plugging was infrequent. The spray nozzles are inspected by operations personnel during spray operation with corrective maintenance initiated as required. With system resistance maintained constant for each test, pump degradation would be identified through changes in differential pressure. Differential pressure is calculated using inlet (based upon lake level or suction pressure) and discharge pressure. The pump can be trended for degradation based on differential pressure at this point. Vibration readings will also be taken at this reference point. The pumps will be tested in this manner for the preservice, the quarterly Group A, and the biennial comprehensive tests.
>
> Instrument accuracy and acceptance criteria for pump differential pressure and vibration will meet the requirements of Table ISTB-3500-1, "Required Instrument Accuracy," and Table ISTB-5200-1, "Vertical Line Shaft and Centrifugal Pumps Test Acceptance

Criteria," respectively, for the appropriate test type.

Preservice test data for differential pressure and vibration data will be evaluated to verify if it represents acceptable pump operation and will be used as reference values for subsequent quarterly Group A and biennial comprehensive tests.

For a new ERCW screen wash pump, the bowl assembly will be tested at the vendor's facility prior to shipment to WBN Unit 1. This test data is adjusted to account for the pump column (in order to represent the fully assembled pump configuration). A vendor pump curve will then be developed and provided to WBN Unit 1 prior to pump installation.

The preservice pump test for a new ERCW screen wash pump will be performed by setting the throttle valves full open (the same position as the Group A and comprehensive tests) and measuring pump differential pressure and vibration. Flow will not be measured. In addition, the condition of the screen spray nozzles will be inspected to verify that the spray covers the screen spray area and the spray force is sufficient to remove any debris present.

The measured differential pressure will be plotted on the vendor pump curve to determine the theoretical flow rate. The differential pressure and theoretical flow rate will then be evaluated against the requirements established in the ERCW screen wash pump design specification, design criteria, and system description (i.e., pump performance should achieve 350 feet total developed head at 270 gallons per minute). If the pump hydraulic data meets the design requirements with some margin to provide for future degradation and the vibration data analysis is acceptable, the pump will be considered to be operating acceptably. Visual examination of screen wash spray nozzle performance provides additional positive verification that the pump is operating acceptably and is capable of performing its safety-related function.

3.2 NRC Staff Evaluation

ISTB-5210(a) requires that the flow rate and pressure be measured at a minimum of five points, in order to develop a pump curve to establish a reference point, during preservice testing of the ERCW screen wash pumps, 1-PMP-67-431-A, 1-PMP-67-440-B, 2-PMP-67-437-A, and 2-PMP-67-447-B. ISTB-5221(b) and ISTB-5223(b) require that the resistance of the ERCW system be varied until the flow rate equals the reference point during Group A and comprehensive pump IST for these screen wash pumps.

For the ERCW screen wash pumps, no in-line instrumentation exists to measure the flow, and the physical configuration of the pumps and piping does not allow the use of portable flow measuring equipment such as ultrasonic flow meters. Piping from the discharge of the pumps is open-ended to the spray nozzles at the traveling screen and is relatively short with multiple elbows, reducers, and valves in different planes. The physical configuration of this piping system is such that no portion of the piping meets the requirements for adequate installation of a permanent flow measuring device. Therefore, measured flow readings from an installed device may not be repeatable or representative of actual pump flow. Significant system modifications, such as piping rerouting and pipe support redesign, would be required to obtain a configuration that would provide reliable flow readings. Based on the above, the NRC staff finds

that compliance with the Code requirements for measuring flow rate on these pumps is impractical.

The purpose of the ERCW screen wash pumps is to provide water at sufficient flow and pressure to clear debris off of the traveling screen. TVA plans to perform pump IST by setting the system resistance to the same point for each test by positioning the throttle valves to the full open position, thereby establishing a fixed resistance system. Flow will not be measured. To ensure that spray nozzle clogging does not mask pump degradation during pump testing, the spray nozzles will be inspected during each test performance with corrective actions initiated as necessary, thus providing assurance that spray nozzle condition will not affect system flow. TVA also stated that pump degradation can be identified and trended through changes in differential pressure.

For a new ERCW screen wash pump, the vendor will test the bowl assembly and adjust the data to account for the pump column. The vendor will develop a pump curve with the adjusted data. For the preservice test, TVA will fully open the discharge throttle valve, measure the differential pressure, and plot the differential pressure on the pump curve to determine the theoretical flow rate. This data will be compared to the design flow rate and differential pressure. Pump vibration will also be measured. If the pump hydraulic data meets the design requirements with some margin to provide for future degradation and the vibration data analysis is acceptable, the pump will be considered to be operating acceptably.

Additionally, the preservice test data for differential pressure and vibration data will be used as reference values for subsequent quarterly Group A and biennial comprehensive tests.

The proposed request to set system resistance to the same point for each test, with the throttle valves full open, while inspecting the spray nozzles to ensure nozzle clogging does not affect system flow, provides reasonable assurance of the operational readiness of these ERCW screen wash pumps.

4.0 CONCLUSION

As set forth above, the NRC staff determined that it is impractical for TVA to comply with certain requirements of the ASME OM Code for ERCW screen wash pump testing, and the proposed testing specified provides reasonable assurance that the ERCW screen wash pumps will remain operationally ready.

Granting relief pursuant to 10 CFR 50.55a(f)(6)(i) is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. All other ASME OM Code requirements for which relief was not specifically requested and approved in the subject request for relief remain applicable.

This relief is granted for WBN Unit 1 for the remainder of the second 10-year IST interval, which began on May 27, 2007 and will end on May 26, 2016.

Principle Contributor: Robert Wolfgang

If you have any questions concerning this matter, please contact the WBN Unit 1 Senior Project Manager, Mr. John G. Lamb, at (301) 415-3100.

Sincerely,

/RA/

Stephen J. Campbell, Chief
Watts Bar Special Projects Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-390

Enclosure:
Safety Evaluation

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