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

October 21, 2014

Mr. Joseph W. Shea
Vice President, Nuclear Licensing
Tennessee Valley Authority
1101 Market Street, LP 3D-C
Chattanooga, TN 37402-2801

SUBJECT: WATTS BAR NUCLEAR PLANT, UNIT 2 – REVIEW OF INSERVICE TEST PROGRAM AND PRESERVICE TEST PROGRAM, AND SAFETY EVALUATION OF RELIEF REQUESTS IST-RR-1/2/3/4 FOR THE FIRST 10-YEAR INTERVAL OF THE INSERVICE TESTING PROGRAM (TAC NO. MF4118)

Dear Mr. Shea:

By letter dated May 8, 2014, as supplemented by letter dated August 5, 2014, Tennessee Valley Authority (TVA, the applicant) submitted an initial baseline (first 10-year) inservice test (IST) program and four relief requests (RRs) to the U.S. Nuclear Regulatory Commission (NRC) for the application of operating license (OL) of Watts Bar Nuclear Plant (WBN), Unit 2. The details of the IST program are provided in the applicant's Technical Instruction 0-TI-100.006, "Inservice Testing Program." The IST program is developed to satisfy the requirements stipulated in Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Section 50.55a, paragraphs (f) and (g), Technical Specification Section 5.7.2.11, and American Society of Mechanical Engineers (ASME) *Code for Operation and Maintenance of Nuclear Power Plants* (OM Code). However, Section 50.55a of 10 CFR Part 50 allows the OL applicants or the licensees to request reliefs from certain IST requirements of the ASME OM Code. Pursuant to 10 CFR 50.55a(a)(3)(i), (a)(3)(ii), and (f)(5)(iii), TVA submitted, in the above letter of May 8, 2014, four RRs (IST-RR-1, IST-RR-2, IST-RR-3, and IST-RR-4) for the first 10-year IST program at WBN, Unit 2.

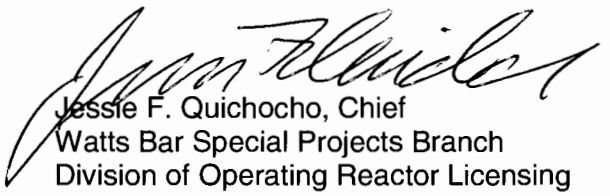
The NRC staff has reviewed the WBN, Unit 2 first 10-year IST program. In addition, NRC made use of the information provided in TVA's letter dated July 31, 2010, for WBN, Unit 1. Based on its review and the applicant's commitment to update the final safety analysis report Section 3.9.6, once the date for OL issuance becomes certain, the NRC staff finds that the IST program for WBN, Unit 2 meets the requirements of 10 CFR 50.55a and the ASME OM Code, and therefore, is acceptable.

The NRC staff has also completed its review of the four RRs as documented in the enclosed safety evaluation (SE). Our SE concludes that: (1) the proposed alternative provides an acceptable level of quality and safety (IST-RR-1); (2) conformance with certain code requirements is impractical for the facility (IST-RR-2 and IST-RR-3); and (3) compliance would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety (IST-RR-4).

The NRC staff further concludes that granting the reliefs 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 2. Therefore, pursuant to Sections 50.55a(a)(3)(i), 50.55a(a)(3)(ii), and 50.55a(f)(5)(iii) of 10 CFR Part 50, the proposed alternatives are authorized for the first 10-year IST interval at WBN, Unit 2. All other ASME OM Code requirements for which relief was not specifically requested and approved remain applicable.

If you have any questions, please contact the Project Manager, Siva P. Lingam at 301-415- 1564 or via e-mail at Siva.Lingam@nrc.gov.

Sincerely,



Jessie F. Quichocho, Chief
Watts Bar Special Projects Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-391

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

INSERVICE TEST AND PRESERVICE TEST PROGRAMS

RELIEF REQUESTS IST-RR-1; IST-RR-2; IST-RR-3; AND IST-RR-4

WATTS BAR NUCLEAR PLANT, UNIT 2

DOCKET NO. 50-391

1.0 INTRODUCTION

By letter dated May 8, 2014 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML 14133A296), as supplemented by letter dated August 5, 2014 (ADAMS Accession No. ML14224A597), Tennessee Valley Authority (TVA, the applicant) submitted an initial baseline (first 10-year) inservice test (IST) program and four relief requests (RRs) to the U.S. Nuclear Regulatory Commission (NRC, the Commission) for the application of operating license (OL) of Watts Bar Nuclear Plant (WBN), Unit 2. The details of the IST program are provided in the applicant's Technical Instruction (TI), 0-TI-100.006, "Inservice Testing Program." The IST program is developed to satisfy the requirements stipulated in Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Section 50.55a, paragraphs (f) and (g), Technical Specification Section 5.7.2.11, and American Society of Mechanical Engineers (ASME) *Code for Operation and Maintenance of Nuclear Power Plants* (OM Code). However, Section 50.55a of 10 CFR Part 50 allows the OL applicants or the licensees to request reliefs from certain IST requirements of the ASME OM Code. Pursuant to 10 CFR 50.55a(a)(3)(i), (a)(3)(ii), and (f)(5)(iii), TVA submitted, in the above letter of May 8, 2014, four RRs (IST-RR-1, IST-RR-2, IST-RR-3, and IST-RR-4) for the first 10-year IST program at WBN, Unit 2.

The IST program for pumps and valves is intended to demonstrate that they will maintain operational readiness at any time during the plant life. These tests and parameter measurements to detect long-term degradation are required to be performed in accordance with 10 CFR 50.55a. Section 50.55a of 10 CFR Part 50, paragraph (f)(4)(i) requires that IST of certain ASME Code Class 1, 2, and 3 pumps and valves be performed at initial and subsequent 120-month (10-year) IST program intervals in accordance with the ASME OM Code, incorporated by reference in the regulations.

In Supplement No. 14 to NUREG-0847, "Safety Evaluation Report Related to the Operation of Watts Bar Nuclear Plant, Units 1 and 2" (ADAMS Accession No. ML073200516), the NRC staff accepted TVA's IST program for WBN, Unit 1, but Section 3.9.6, "Inservice Testing of Pumps and Valves (Unit 1)" of the above supplemental safety evaluation report (SSER) was not applicable to WBN, Unit 2. TVA was required to submit, for NRC review, a plant-specific IST

Enclosure

program for WBN, Unit 2. In Amendment No. 97 to the WBN, Unit 2 final safety analysis report (FSAR), TVA states in FSAR Section 3.9.6 that IST of ASME Code Class 1, 2, and 3 pumps and valves will be conducted to the extent practical in accordance with the 2001 edition of ASME OM Code with addenda through 2003. This is inconsistent with the requirements of 10 CFR 50.55a(f)(4)(i). In a letter to the NRC dated July 31, 2010 (ADAMS Accession No. ML102290258), TVA noted that the above sentence in Amendment 97 was in error and that Amendment 100 would update Amendment 97. In Amendment 100 to the WBN, Unit 2 FSAR, the above sentence was revised to read, "IST of ASME Code Class 1, 2, and 3 pumps and valves will be conducted to the extent practical in accordance with latest edition and addenda of the ASME OM Code incorporated by reference in 10 CFR 50.55a(b) on the date 12 months before the date of issuance of operating license for Unit 2 as required by 10 CFR 50 55a(f)." By letter dated July 31, 2010, TVA was committed, once the date for issuance of an operating license (OL) becomes certain, to update FSAR Section 3.9.6, in accordance with 10 CFR 50.55a(f)(4)(i), and submit an initial/baseline IST Program to the NRC for review and approval. In SSER 22 of NUREG-0847 (ADAMS No. ML110390197), the NRC identified the development and submittal of an acceptable IST program for WBN, Unit 2 as Open Item 13.

To close Open Item 13, TVA, by letter dated May 8, 2014, submitted an initial/baseline IST program for WBN, Unit 2 as Enclosure 1, "WBN Technical Instruction, 0-TI-100.006, "Inservice Testing Program," for NRC review. The program is developed to satisfy the requirements stipulated in 10 CFR 50.55a, and the 2004 edition through 2006 addenda of ASME OM Code. However, Section 50.55a of 10 CFR Part 50 allows the OL applicants or the licensees to request reliefs from certain IST requirements of the ASME OM Code. Pursuant to 10 CFR 50.55a(a)(3)(i), (a)(3)(ii), and (f)(5)iii), TVA submitted, in the above letter of May 8, 2014, four requests for relief for the initial/baseline IST program at WBN, Unit 2.

NRC staff's review under Standard Review Plan, NUREG-0800, Chapter 3, Section 3.9.6 covered the applicant's program for preservice and IST of pumps and valves and emphasized those areas of the test program for which the applicant requested relief from the requirements of the ASME OM Code.

2.0 REGULATORY EVALUATION

Section 50.55a, paragraph (f) of 10 CFR Part 50, "Inservice Testing Requirements," requires, in part, that IST of certain ASME Code Class 1, 2, and 3 components must meet the requirements of the ASME OM Code and applicable addenda except where alternatives have been authorized by the NRC pursuant to paragraphs (a)(3)(i) or (a)(3)(ii).

Section 50.55a, paragraph (a)(3) of 10 CFR Part 50 states, in part, that alternatives to the requirements of paragraph (f) may be used, when authorized by the NRC, if the applicant demonstrates that: (i) the proposed alternatives would provide an acceptable level of quality and safety, or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Section 50.55a, paragraph (f)(5)(iii) of 10 CFR Part 50, states, in part, that licensees may determine that conformance with certain code requirements is impractical and that the licensee shall notify the Commission and submit information in support of the determination.

Section 50.55a, paragraph (f)(6)(i) of 10 CFR Part 50, states that the Commission will evaluate determinations under paragraph (f)(5) of this section that code requirements are impractical. The Commission may grant such relief and may impose such alternative requirements as it determines 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.

This safety evaluation (SE) applies to the first 10-year interval IST program. Pursuant to 10 CFR 50.55a(f)(4)(i), the current code of record for WBN, Unit 2 is the ASME OM Code, 2004 edition through 2006 addenda. However, if extended delay of the commercial date were to occur, the initial/baseline IST program for WBN, Unit 2 shall be updated to comply with the requirements of ASME Code incorporated by reference in 10 CFR 50.55a 12 months prior to the commercial date.

3.0 TECHNICAL EVALUATION

3.1 Inservice Test Program and Preservice Test Program

The NRC staff has reviewed the WBN, Unit 2 first 10-year IST program. In addition, NRC made use of the information provided in TVA's letter dated July 31, 2010 for WBN, Unit 1. Based on its review and the applicant's commitment to update the FSAR Section 3.9.6, once the date for OL issuance becomes certain, the NRC staff finds that the IST program for WBN, Unit 2 meets the requirements of 10 CFR 50.55a and the ASME OM Code, and therefore, is acceptable.

3.1.1 Review of "Alternative Frequency Justifications"

TVA included 31 test deferrals in the IST program covering approximately 260 valves. For each of the test deferrals, TVA's justification appears to be reasonable, considering the safety-related functions and the effects and plant operation if testing was performed during power operations. The deferrals appear to comply with the requirements in Section ISTC-3510 of the ASME OM Code for exercising valves. Further, the NRC staff review of test deferrals is through inspection, as noted in response to Question 102 of the "Minutes of the Public Meetings on Generic Letter 89-04," dated October 25, 1989.

3.2 Relief Requests

The SE that follows addresses the alternative or RRs submitted in the WBN Technical Instruction, 0-TI-100.006, "Inservice Testing Program," for the first 10-year IST Program interval for pumps and valves at WBN, Unit 2.

3.2.1 Relief Request IST-RR-1, Pump Vibration Reference Values and Acceptance Criteria

The IST Program covers 8 ASME Code Class 2 pumps and 24 ASME Code Class 3 pumps. Alternative or RRs for the Code Class pumps are subject to review and approval by the Commission in accordance with 10 CFR 50.55a.

TVA requested alternative to ISTB-3300(a) of the ASME OM Code, which requires that initial vibration reference values be determined from the results of tests meeting the requirements

of ISTB-3100, "Preservice Testing," or from the results of the first inservice test. Relief was requested for the following pumps at WBN, Unit 2:

Pump Description	Pump Identification
Essential Raw Cooling Water (ERCW) Pump A-A	0-PMP-67-28-A
ERCW Pump B-A	0-PMP-67-32-A
ERCW Pump C-A	0-PMP-67-36-A
ERCW Pump D-A	0-PMP-67-40-A
ERCW Pump E-B	0-PMP-67-47-B
ERCW Pump F-B	0-PMP-67-51-B
ERCW Pump G-B	0-PMP-67-55-B
ERCW Pump H-B	0-PMP-67-59-B
Main Control Room CW Pump A-A	0-PMP-31-80/1-A
Main Control Room CW Pump B-B	0-PMP-31-96/1-B
Electrical Board Room CW Pump A-A	0-PMP-31-128/1-A
Electrical Board Room CW Pump B-B	0-PMP-31-129/1-B
Shutdown Board Room CW Pump A-A	0-PMP-31-36/1-A
Shutdown Board Room CW Pump B-B	0-PMP-31-49/1-B
Component Cooling System (CCS) Pump C-S	0-PMP-70-51-S
ERCW Screen Wash Pump 2A-A	2-PMP-67-437-A
ERCW Screen Wash Pump 2B-B	2-PMP-67-447-B
Turbine Driven Auxiliary Feedwater Pump 2A-S	2-PMP-3-2A-S
Auxiliary Feedwater (AFW) Pump 2A-A	2-PMP-3-118-A
AFW Pump 2B-B	2-PMP-3-128-B
Centrifugal Charging Pump 2B-B	2-PMP-62-104-B
Centrifugal Charging Pump 2A-A	2-PMP-62-108-A
Boric Acid Transfer Pump 2A-A	2-PMP-62-230-A
Boric Acid Transfer Pump 2B-B	2-PMP-62-232-B
Safety Injection Pump 2A-A	2-PMP-63-10-A
Safety Injection Pump 2B-B	2-PMP-63-15-B
CCS Pump 2B-B	2-PMP-70-33-B
CCS Pump 2A-A	2-PMP-70-59-A
Containment Spray Pump 2B-B	2-PMP-72-10-B
Containment Spray Pump 2A-A	2-PMP-72-27-A
Residual Heat Removal (RHR) Pump 2A-A	2-PMP-74-10-A
RHR Pump 2B-B	2-PMP-74-20-B

3.2.1.1 TVA Basis for Requesting a Proposed Alternative

This request applies to the vibration reference values (Vr) associated with vibration testing. Small values for Vr result in small acceptable ranges for pump operation. The acceptable ranges defined in Tables ISTB-5121-1 and ISTB-5221-1 are less than or equal to 2.5Vr. Based on a small acceptable range, a smooth running pump could be subject to unnecessary corrective action caused by numerically small changes in vibration levels.

For very small reference values, hydraulic noise and instrument error can be a significant portion of the reading and affect the repeatability of subsequent measurements. Also,

experience gathered from the WBN, Unit 1 preventive maintenance program has shown that changes in vibration levels in the range of 0.05 inches per second (ips) do not normally indicate significant degradation in pump performance.

To avoid unnecessary corrective action, a minimum value for Vr of 0.05 ips is being established for velocity measurements. This minimum value will be applied to individual vibration locations for the pumps listed above, where the measured reference value is less than 0.05 ips.

The Predictive Maintenance Program currently employs the following predictive monitoring techniques on an as applicable and as needed basis:

A. Vibration monitoring and analysis beyond that required by ISTB,
B. Oil sampling and analysis, and
C. Thermographic analysis.

Bearing temperature trending is available for some components through the plant process computer system.

3.2.1.2 TVA Proposed Alternative Testing

Pumps with a measured reference value below 0.05 ips for a particular vibration measurement location shall have subsequent test results for that location compared to an acceptable range based on 0.05 ips. In addition to the applicable ASME OM Code requirements, all pumps in the IST Program will be included in and will remain in the Predictive Maintenance Program regardless of their smooth running status. When new reference values are established, the measured parameters will be evaluated for each location to determine if the provisions of this RR still apply. If the measured Vr is greater than 0.05 ips, the requirements of ISTB-3300 will be applied even if the pump is identified above. Conversely, if the measured Vr is less than or equal to 0.05 ips, a minimum value of 0.05 ips will be used in determining the acceptable, alert, and required action ranges.

3.2.1.3 NRC Staff Evaluation

Subsection ISTB of ASME OM Code requires that the vibration of all safety-related pumps be measured. For centrifugal pumps, the measurements of each pump are taken in a plane approximately perpendicular to the rotating shaft in two orthogonal directions on each accessible pump-bearing housing. For vertical line shaft pumps, the vibration measurements are taken on the upper motor-bearing housing in three orthogonal directions, including the axial direction. The measurement is also taken in the axial direction on each accessible pump thrust bearing housing. These measurements are to be compared with the ASME OM Code specified vibration acceptance criteria to determine if the measured values are acceptable.

Tables ISTB-5121-1 and ISTB-5221-1 define that, if during an inservice test, a vibration measurement exceeds 2.5 times Vr, the pump is considered in the alert range. The frequency of testing is then doubled in accordance with ISTB-6200 until the condition is corrected and the vibration level returns below the alert range. Pumps whose vibration is recorded to be 6 times Vr, are considered in the required action range, and must be declared inoperable until the cause of the deviation has been determined and condition is corrected. The vibration reference values required by Subsection ISTB-3300 are determined when the pump is in good condition.

For pumps whose absolute magnitude of vibration is very small and may be an order of magnitude below the absolute vibration limits in Tables ISTB-5121-1 and ISTB-5221-1, a relatively small increase in vibration magnitude may cause the pump to enter the alert or required action range. These instances may be attributed to variation in flow, instrument accuracy, or other noise sources that would not be associated with degradation of the pump. Pumps that operate in this region are typically referred to as smooth running. Based on a small acceptable range, a smooth running pump could be subjected to unnecessary corrective action.

TVA's proposal combines the minimum reference value method with a commitment to monitor all the IST pumps with a Predictive Maintenance Program even if certain pumps have very low vibration readings and are considered to be smooth running pumps. TVA will assign a vibration reference value of 0.05 ips to any pump vibration direction where, in the course of determining its reference value, a measured value is below 0.05 ips. Therefore, the acceptable range as defined in Tables ISTB-5121-1 and ISTB-5221-1 will be less than or equal to 0.125 ips and the alert range will be 0.125 to 0.30 ips.

TVA states that this Watts Bar Predictive Maintenance Program goes beyond the IST requirements for pumps. The program includes the availability of bearing temperature trending for some pumps, oil sampling and analysis, and thermographic analysis. TVA also states that if the measured parameters are outside the normal operating range or are determined by analysis to be trending towards an unacceptable degraded state, appropriate actions will be taken. These actions include increased monitoring to establish the rate of change, review of component-specific information to identify cause, and removal of the pump from service to perform maintenance. Therefore, the proposed alternative is consistent with the objective of the IST, which is to determine degradation in safety-related components.

As described above, the use of the suggested reference value of 0.05 ips will provide an acceptable range less than or equal to 0.125 ips and an alert range from 0.125 to 0.30 ips. The reference value of 0.05 ips is consistent with previous NRC staff SEs of similar issues for WBN, Unit 1 (ADAMS Accession No. ML070090504, dated March 9, 2007), and experience gathered from the WBN, Unit 1 preventive maintenance program has shown that changes in vibration levels below the range of 0.05 ips do not normally indicate significant degradation in pump performance. Therefore, the NRC staff finds that the licensee's proposed alternative will provide an acceptable level of quality and safety.

3.2.1.4 Conclusion

As set forth above, the NRC staff determines that the TVA's proposed alternative provides acceptable level of quality and safety. Accordingly, the NRC staff concludes that TVA has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(a)(3)(i).

Therefore, the NRC staff authorizes the proposed alternative for the first 10-year IST interval at WBN, Unit 2. All other ASME OM Code requirements for which relief was not specifically requested and approved in the subject request for relief remain applicable.

3.2.2 Relief Request IST-RR-2, ERCW Screen Wash Pump Test Method

The licensee requested relief from ISTB-5221(b) and ISTB-5223, which requires 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. Specific relief is requested from the requirement to measure flow rate during Group A and biennial comprehensive tests for the following ERCW screen wash pumps at WBN, Unit 2:

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

3.2.2.1 TVA Basis for Requesting a Proposed Alternative

The piping design does not provide in-line instrumentation to measure flow. The pump design (vertical line shaft) and discharge piping do not allow the use of portable flow measuring equipment such as ultrasonic flow meters. These pumps take suction from the pump pit directly below the pump deck and are positioned on the deck adjacent to the traveling screens. The discharge piping for each pump is short and open-ended, containing several elbows, reducers, and valves prior to entering the traveling screen enclosure. The configuration of the piping system does not provide straight lengths of piping that will support the installation of a permanent flow measuring device or the utilization of a portable flow measuring device capable of providing accurate flow rate measurements. Significant system modifications, such as piping rerouting and 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 verifying the effectiveness of the flushing operation.

3.2.2.2 TVA Proposed Alternative Testing

Testing 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. 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 Tables ISTB-3510-1 and Table ISTB-5221-1, respectively. 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.

Maintenance history at WBN, Unit 1 was reviewed for spray nozzle plugging and it was determined that nozzle plugging was infrequent. The spray nozzles will be inspected by operations personnel during spray operation with corrective maintenance initiated as required. In the event that preservice pump testing became necessary due to repair, replacement, or maintenance activities that could affect the pump reference values, the affected pump would be tested as a Group A fixed resistance system pump. System resistance would be established at a repeatable condition by verifying the pump discharge throttle valve is locked in its normal full open position and ensuring acceptable condition of the screen wash spray nozzles. Acceptable condition of the spray nozzles would be verified by inspecting the nozzles and verifying that the nozzle spray covers the screen spray area with sufficient force to remove any debris present on the screen. With the pump in operation, pump differential pressure and vibration would be measured. Flow rate would not be measured due to limitations in system configuration. This test method is identical to that performed during previous pump tests at WBN, Unit 1. Test data (pump differential pressure and vibration) would be compared to (1) the design requirement to produce 350 feet Total Dynamic Head, (2) the pump vendor curve, and (3) previous trend data for pump differential pressure and vibration.

3.2.2.3 NRC Staff Evaluation

ISTB-5210(a) requires that the flow rate be measured at a minimum of five points, to establish the flow reference point, during preservice testing of the ERCW screen wash pumps 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 do 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 ASME OM Code requirements for measuring flow rate on these pumps is impractical.

For the preservice test, the affected pump will be tested as a Group A fixed resistance system pump. System resistance will be established at a repeatable condition by verifying the pump discharge throttle valve is locked in its normal full open position and ensuring acceptable condition of the screen wash spray nozzles. Acceptable condition of the spray nozzles will be verified by inspecting the nozzles and verifying that the nozzle spray covers the screen spray area with sufficient force to remove any debris present on the screen. The spray nozzles will be inspected by operations personnel during spray operation with corrective maintenance initiated as required. TVA states that maintenance history at WBN, Unit 1 was reviewed for spray nozzle plugging and it was determined that nozzle plugging was infrequent. With the pump in operation, pump differential pressure and vibration would be measured. 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. If the hydraulic data meet the pump design requirements and the vibration data is acceptable, the pump will be considered to be operating acceptably.

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 proposes 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 with corrective actions initiated as necessary, thus providing assurance that spray nozzle condition will not affect system flow. Consequently, pump degradation can be identified and trended through changes in differential pressure. The NRC staff finds that the proposed alternative to set system resistance to the same point 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. Furthermore, the proposed alternative is consistent with previous NRC staff SEs for WBN, Unit 1 of similar issues (ADAMS Accession No. ML102360191, dated August 30, 2010).

3.2.2.4 Conclusion

As set forth above, the NRC staff determines that it is impractical for TVA to comply with the specified requirement, and the proposed testing provides reasonable assurance that the components are operationally ready. Accordingly, the NRC staff concludes that TVA has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(f)(6)(i). The NRC staff further concludes that 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 TVA that could result if the requirements were imposed on the facility. Therefore, relief is granted for the first 10-year IST interval at WBN, Unit 2. All other ASME OM Code requirements for which relief was not specifically requested and approved in the subject request for relief remain applicable.

3.2.3 Relief Request IST-RR-3, Reactor Head Vent Valve Stroke Time Testing:

The IST Program covers approximately 680 valves. It includes 31 "Deferred Test Frequency Justifications," which address deferred testing for approximately 260 valves, and 2 relief

requests. The results of the staff's evaluation of the 31 alternate frequency justifications are summarized in Section 3.1.1.

TVA requested relief from ISTC-5151 of the ASME OM Code, which requires that active valves have their stroke times measured and assessed when exercised in accordance with ISTC-3500. Relief was requested for the following reactor coolant system head (RCSH) vent valves:

2-FSV-68-396-B
2-FSV-68-397-A

3.2.3.1 TVA Basis for Requesting a Proposed Alternative

The RCSH vent throttle valves are throttled open manually by main control room operator action to (1) provide a reactor vessel head vent path; (2) vent noncondensables from the head during an accident to promote natural circulation; and (3) prevent gases from impeding reactor coolant circulation flow through the core. These valves are totally enclosed (seal welded bonnet), 1-inch Target Rock solenoid valves with thumb-wheel actuated controllers that permit remote positioning of the valves. Valve opening and closing speed, and consequently valve opening and closing stroke time, are controlled by the rate at which the thumb-wheel controller is moved, not upon valve condition. Design requirements impose a minimum stroke time limitation on these valves of not faster than 5 seconds. Restricting the stroke time to not less than 5 seconds effectively prohibits stroke timing the valve because the valve is capable of stroking considerably faster than the 5-second limit. Even if the 5-second limit did not exist, stroke timing of the valve using its thumb-wheel actuated controller would result in timing the ability of the operator to turn the thumb-wheel and not the ability of the valve to move. Additionally, significant system modifications, such as alteration of the valve's control circuit to provide a separate hand switch to permit instantaneous valve operation, would be required solely to allow for the performance of valve stroke time testing.

An enhanced maintenance program of disassembly and inspection of valve internal parts was evaluated. This method was not considered appropriate for the following reasons:

A. Frequent disassembly can lead to distortion of the valve parts caused by the repetitive welding process to reinstall the seal weld. This distortion could cause unacceptable operational seat leakage, binding of internal parts, and other operational problems.

B. The physical appearance of the internal parts does not always provide clear and evident verification of acceptable valve operation.

Based on the information provided above, compliance with the ASME OM Code requirements is impractical.

3.2.3.2 TVA Proposed Alternative Testing

TVA proposes to utilize an enhanced maintenance program based on the following attributes:

A. Periodic replacement of critical valve parts (i.e., the linear voltage differential transformer (LVDT) that provides valve position indication feedback, the coil that operates the valve,

and the valve's electrical terminal board) in accordance with TVA's environmental qualification binder for the valve.

B. Calibration of the valve's position control system each refueling outage. This calibration involves utilizing the valve controller to position the valve at various positions and utilizing the LVDT to determine the valve stem position. These are compared to ensure valve operation is as expected.

In addition to the enhanced maintenance program, tests will be conducted as follows to provide positive verification of the valve's ability to fulfill its specific function:

A. Full stroke exercise of each valve during shutdowns. The test consists of cycling the valve controller through one complete cycle and verifying (using the valve position indicator operated by the LVDT attached to the valve stem) that the valve cycles through one full cycle in response to the valve controller.

B. During refueling outages, in addition to cycling the controller through one complete cycle and using the valve position indicator to verify valve travel, supplement the verification of valve travel by (a) ensuring no detectable flow is present through the valves with the valves closed, (b) ensuring that with each valve open flow is present, and (c) ensuring that when each valve is returned to the closed position, no detectable flow is present. The presence or absence of flow is verified by monitoring a change in a process parameter, either the valve tail pipe temperature for an increase/decrease or the pressurizer relief tank for a temperature increase/decrease or level increase/no change. This additional verification, which is consistent with ISTC-3520, ensures the valve disk is still attached to the stem and is capable of controlling flow.

3.2.3.3 NRC Staff Evaluation

The RCSH vent valves 2-FSV-68-396-B and 2-FSV-68-397-A are throttled open manually to provide a reactor vessel head vent path and vent noncondensable from the head during an accident to promote natural circulation. The ASME OM Code requires that active valves have their stroke times measured and assessed when exercised in accordance with ISTC-3500. The valves are totally enclosed (seal welded bonnet) 1-inch Target Rock solenoid valves with thumb-wheel actuated controllers that permit remote positioning of the valves. Valve opening and closing speed, and consequently valve opening and closing stroke time are controlled by the rate at which the thumb-wheel controller is moved, not upon valve condition. Design requirements impose a minimum stroke time limitation on these valves of not faster than 5 seconds. Restricting the stroke time to not less than 5 seconds effectively prohibits stroke timing the valve because the valve is capable of stroking considerably faster than the five-second limit. Even if the 5-second limit did not exist, stroke timing of the valve using its thumb-wheel actuated controller would result in timing the ability of the operator to turn the thumb-wheel and not the ability of the valve to move. Based on the above considerations, the NRC staff considers that stroke time testing of the valves is impractical and would provide no meaningful information with regard to valve condition.

The licensee proposes to utilize an enhanced maintenance program along with full stroke exercising during shutdowns and verification of valve travel during refueling outages by

(a) ensuring no detectable flow is present through the valves with the valves closed, (b) ensuring that with each valve open flow is present, and (c) ensuring that when each valve is returned to the closed position, no detectable flow is present. This additional verification, which is consistent with ISTC-3520, ensures the valve disk is still attached to the stem and is capable of controlling flow. The NRC staff finds that the TVA proposed alternative provides reasonable assurance of the operational readiness of the RCSH vent throttle valves. Furthermore, the proposed alternative is consistent with previous NRC staff SEs of similar issues for WBN, Unit 1 (ADAMS No. ML070090504, dated March 9, 2007).

3.2.3.4 Conclusion

As set forth above, the NRC staff determines that it is impractical for TVA to comply with the specified requirement, and the proposed testing provides reasonable assurance that the components are operationally ready. Accordingly, the NRC staff concludes that TVA has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(f)(6)(i). The NRC staff further concludes that 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 TVA that could result if the requirements were imposed on the facility. Therefore, relief is granted for the first 10-year IST interval at WBN, Unit 2. All other ASME OM Code requirements for which relief was not specifically requested and approved in the subject request for relief remain applicable.

3.2.4 Relief Request IST-RR-4, Unit 2 Pressurizer Safety Valve Test Before Electric Generation:

TVA requested an alternative to Appendix I, paragraph I-7210 of ASME OM Code, which requires for Class 1 Safety Valves that within 6 months before initial reactor criticality, each valve shall have its set-pressure verified. Set-pressure verification shall be determined by pressurizing the system up to the valve set-pressure and opening the valve or the valve may be tested at or below normal system operating pressure with an assist device. Relief was requested for the following Pressurizer Safety Valves (PSVs):

2-RFV-68-563
2-RFV-68-564
2-RFV-68-565

3.2.4.1 TVA Basis for Requesting a Proposed Alternative

Relief is being requested from verifying set-pressure while the valves are installed in the plant using system pressure or reduced system pressure with an assist device. These test methods would require personnel entry into a confined space at high ambient temperatures to install/remove the lift assist device on the PSVs or require plant operators to raise reactor coolant system (RCS) pressure to the overpressure condition necessary to open the PSV to meet the requirements of ASME OM Code paragraph I-7210 of Appendix I with two out of three PSVs gagged and repeat this evolution three times in succession, once for each PSV.

In addition, there are a number of issues that make testing in the installed configuration a hardship without compensating increase in the level of quality and safety. The following problems would be encountered:

A. Raising RCS pressure to the overpressure condition necessary to open the valve to meet ASME OM Code I-7210 with two out of three valves gagged would create an undesirable operating condition. This condition would have to be repeated three times in succession, once for each PSV.

B. While an assist device is available, it is generally used on other valve installations (i.e., the main steam safety valves) in less restrictive locations. Testing with the assist device necessitates that test personnel are in close proximity to the valves in a confined space (the pressurizer enclosure) with temperatures above 160 degree Fahrenheit (°F), which represents a potential safety hazard. These temperatures would increase with the lifting of the valves during testing. Extraction of test personnel, should they become incapacitated by injury or illness, would be difficult.

C. The rupture pressure of the pressurizer relief tank rupture disk is 88 to 100 pounds per square inch gauge. It is possible that the amount of discharge that would result from testing the PSVs in situ could cause the rupture disk to rupture and discharge the contents of the tank into the containment building, resulting in personnel hazards and equipment damage.

D. Instruments including those on the assist device, used during testing would have to be qualified for the high ambient temperature, which is not feasible, thereby potentially reducing the accuracy of testing with the assist device.

E. The accuracy of the testing performed using the assist device is, in general, not as good as that of the test facility.

F. Controlling the RCS pressure to support the in situ PSV testing would be difficult.

Therefore, these in situ conditions represent a hardship in performing the test and unusual difficulty without a compensating increase in the level of quality and safety.

3.2.4.2 TVA Proposed Alternative Testing

TVA proposes to perform set-pressure testing of the PSVs at an approved vendor test facility within 6 months prior to initial reactor criticality.

The PSVs will be set-pressure tested using steam at the same facility that tests similar or identical valves from TVA and many other nuclear utilities in accordance with the requirements of ASME OM Code Appendix I. The valves will be installed on a steam test header at the vendor test facility in their normal vertical operating position. The valves will be thermally stabilized in an environmental chamber to an ambient temperature of 135 °F ± 5 °F for a minimum of 12 hours prior to test. As part of thermal stabilization, the steam accumulator and the valve inlet will be pressurized with saturated steam at 90 percent of the valve set-pressure for a minimum of 6 hours. After thermal stabilization is completed, testing for pre-test seat

leakage, as-found or as-left set-pressure, and post-test seat leakage will be conducted using saturated steam in the environmental chamber. A final seat leakage test using gaseous nitrogen will be conducted outside the chamber at ambient conditions prior to releasing the valve for return to WBN, Unit 2.

The valves are shipped to the vendor test facility and returned in an upright position. They are inspected upon arrival at the vendor test facility and on return to WBN, Unit 2 for damage or alteration. The valves are stored in a controlled storage area at the vendor test facility or at WBN, Unit 2 during any prolonged non-testing period. Prior to and after testing is completed, the adjusting bolt locking device will be verified and/or torqued to 150 ft-lbs. Lock wires and seals will be installed to prevent changes to the certified valve set-pressure. Valves will be lifted using approved lifting points and Foreign Material Exclusion (FME) will be maintained while the valves are removed from the system. The requested alternative is an activity normally performed during refueling outages for WBN, Unit 1. The same site organizations and procedures/practices used for handling and shipping the WBN, Unit 1 valves will be used to perform this activity. No instances have occurred in WBN, Unit 1 where handling, shipping, storage, removal or installation issues have resulted in changes in set-pressure of these valves.

The proposed alternative is essentially the same test method allowed by ASME OM Code Mandatory Appendix I and is used during the IST interval, which is performed in conjunction with refueling outages where one or more PSVs are either (a) removed, tested at a vendor facility, and reinstalled, or (b) replaced with valve(s) that were pretested at a vendor facility.

3.2.4.3 NRC Staff Evaluation

In lieu of testing the PSVs in the installed conditions as required by ASME OM Code I-7210, TVA proposes to perform the preservice test using steam at the vender facility that tests similar or identical valves from TVA and many other nuclear utilities. The valves will be installed on a steam test header at the vendor test facility in their normal vertical operating position. The valves will be thermally stabilized in an environmental chamber to an ambient temperature of 135 °F ± 5 °F for a minimum of 12 hours prior to test. As part of thermal stabilization, the steam accumulator and the valve inlet will be pressurized with saturated steam at 90 percent of the valve set-pressure for a minimum of 6 hours. After thermal stabilization is completed, testing for pre-test seat leakage, as-found or as-left set pressure, and post-test seat leakage will be conducted using saturated steam in the environmental chamber. A final seat leakage test using gaseous nitrogen will be conducted outside the chamber at ambient conditions prior to releasing the valve for return to WBN, Unit 2.

Following the set pressure test at the test facility, the valves will then be shipped to WBN, Unit 2, and they will be inspected upon arrival for damage or alteration. The valves will be stored in a controlled storage area at WBN, Unit 2 during any prolonged nontesting period. Prior to and after testing is completed, the adjusting bolt locking device will be verified and/or torqued to 150 ft-lbs. Lock wires and seals will be installed to prevent changes to the certified valve set-pressure. Valves will be lifted using approved lifting points and FME will be maintained while the valves are removed from the system. As such, the valves' set-pressure settings should remain as tested. Furthermore, this requested alternative is an activity normally performed during refueling outages for WBN, Unit 1. The same site organizations and procedures/practices used for handling and shipping the WBN, Unit 1 valves will be used to

perform this activity. TVA states that no instances have occurred in WBN, Unit 1 where handling, shipping, storage, or removal/installation issues have resulted in changes in set-pressure of these valves.

The NRC staff finds that the testing at the test facility is more accurate than a test that could be performed in the installed configuration because the test conditions can be better controlled at the test facility, and that the TVA has adequate procedures and FME to ensure the valves' set-pressure remained as tested. Additionally, similar relief was authorized for WBN, Unit 1 (ADAMS Accession No. ML073200570, dated September 5, 1995). Therefore, the NRC staff finds that the proposed alternative provides reasonable assurance of the operational readiness of the PSVs.

3.2.4.4 Conclusion

As set forth above, the NRC staff determines that the TVA's proposed alternative provides reasonable assurance that the components are operationally ready. Accordingly, the NRC staff concludes that TVA has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(a)(3)(ii). Therefore, the NRC staff authorizes the proposed alternative for the first 10-year IST interval at WBN, Unit 2. All other ASME OM Code requirements for which relief was not specifically requested and approved in the subject request for relief remain applicable.

Principal Contributor: John Huang

Date: October 21, 2014

The NRC staff further concludes that granting the reliefs 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 2. Therefore, pursuant to Sections 50.55a(a)(3)(i), 50.55a(a)(3)(ii), and 50.55a(f)(5)(iii) of 10 CFR Part 50, the proposed alternatives are authorized for the first 10-year IST interval at WBN, Unit 2. All other ASME OM Code requirements for which relief was not specifically requested and approved remain applicable.

If you have any questions, please contact the Project Manager, Siva P. Lingam at 301-415- 1564 or via e-mail at Siva.Lingam@nrc.gov.

Sincerely,

/RA/

Jessie F. Quichocho, Chief
Watts Bar Special Projects Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-391

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