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

March 10, 2016

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

SUBJECT: WATTS BAR NUCLEAR PLANT, UNIT 1 – UPDATED INSERVICE TESTING PROGRAM RELIEF REQUEST FOR PUMPS AND VALVES – THIRD 10-YEAR INTERVAL (CAC NO. MF6191)

Dear Mr. Shea:

By letter dated April 9, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15103A322), as supplemented by letter dated September 24, 2015 (ADAMS Accession No. ML15268A538), Tennessee Valley Authority (TVA, the licensee) requested relief from the requirements of the American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of Nuclear Power Plants (OM Code), for the inservice testing (IST) program at the Watts Bar Nuclear Plant (WBN), Unit 1, for the third 10-year IST program interval.

The third 10 year interval for WBN, Unit 1, is currently scheduled to begin on May 27, 2016. However, the third 10-year IST program interval at WBN, Unit 1, will be adjusted to begin coincident with the start of the first 10-year interval for WBN, Unit 2, upon the start of commercial operation of WBN, Unit 2. Should the start of commercial operation of WBN, Unit 2, be after May 27, 2016, and extend beyond the ASME OM Code limitations for extending the third 10-year IST program interval for WBN, Unit 1, TVA shall submit an additional request for approval.

The U.S. Nuclear Regulatory Commission (NRC) staff has determined that proposed alternative Relief Request IST-RR-1 for WBN, Unit 1, provides an acceptable level of quality and safety. Accordingly, the NRC staff concludes that TVA has adequately addressed all of the regulatory requirements set forth in Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(z)(1), for this alternative. Therefore, pursuant to 10 CFR 50.55a(z)(1), the NRC staff authorizes the use of this alternative for WBN, Unit 1, for the third 10-year IST program interval.

Furthermore, the NRC staff has determined that it is impractical for the licensee to comply with certain requirements and that proposed alternative Relief Requests IST-RR-2 and IST-RR-3 provide reasonable assurance that the affected components will remain operationally ready. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(f)(6)(i) for these proposed alternatives. Therefore, pursuant to 10 CFR 50.55a(f)(6)(i), the NRC staff authorizes the use of IST-RR-2 and IST-RR-3 alternatives for WBN, Unit 1, for the third 10-year IST program interval.

Finally, the NRC staff has determined that granting relief pursuant to 10 CFR 50.55a(f)(6)(i) for the third 10-year IST program interval 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 requests remain applicable.

If you have any questions, please contact the project manager, Robert Schaaf, at 301-415-6020 or Robert.Schaaf@nrc.gov.

Sincerely,

Benjamin G. Beasley, Branch Chief
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-390

Enclosure:
Safety Evaluation

cc w/enclosure: Distribution via Listserv

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

PUMP AND VALVE RELIEF REQUESTS IST-RR-1, IST-RR-2, AND IST-RR-3

RELATED TO THE INSERVICE TESTING PROGRAM, THIRD 10-YEAR INTERVAL

TENNESSEE VALLEY AUTHORITY

WATTS BAR NUCLEAR PLANT, UNIT 1

DOCKET NUMBER 50-390

1.0 INTRODUCTION

By letter dated April 9, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15103A322), as supplemented by letter dated September 24, 2015 (ADAMS Accession No. ML15268A538), Tennessee Valley Authority (TVA, the licensee) requested relief from the requirements of the American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of Nuclear Power Plants (OM Code), for the inservice testing (IST) program at the Watts Bar Nuclear Plant (WBN), Unit 1, for the third 10-year IST program interval.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(a)(3)(i), the licensee requested to use the proposed alternative in IST-RR-1 on the basis that the alternative provides an acceptable level of quality and safety. Pursuant to 10 CFR 50.55a(f)(5)(iii), in Relief Requests IST-RR-2 and IST-RR-3, the licensee requested relief from certain IST requirements on the basis that compliance with the ASME Code requirements is impractical.

The WBN, Unit 1, third 10-year IST program interval is scheduled to begin on May 27, 2016. However, the third 10-year IST program interval at WBN, Unit 1, will be adjusted to begin coincident with the start of the first 10-year interval for WBN, Unit 2, upon the start of commercial operation of WBN, Unit 2.

2.0 REGULATORY EVALUATION

Section 50.55a, paragraph (f), of 10 CFR, "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 incorporated by reference in the regulations. Exceptions are allowed where alternatives have been authorized or relief has been granted by the U.S. Nuclear Regulatory Commission (NRC) pursuant to paragraphs 10 CFR 50.55a(z)(1), 10 CFR 50.55a(z)(2), or 10 CFR 50.55a(f)(6)(i).

By *Federal Register* notice (79 FR 65776) dated November 5, 2014, which became effective on December 5, 2014, the paragraph headings in 10 CFR 50.55a were revised. Accordingly, relief requests that had been previously covered by 10 CFR 50.55a(a)(3)(i) are now covered under the equivalent 10 CFR 50.55a(z)(1), and relief requests that had been previously covered by 10 CFR 50.55a(a)(3)(ii) are now covered under the equivalent 10 CFR 50.55a(z)(2). The regulation in 10 CFR 50.55a(z), "Alternatives to codes and standards requirements," states that alternatives to the requirements of paragraphs (b) through (h) of this section, or portions thereof, may be used when authorized by the Director of the Office of Nuclear Reactor Regulation, or Director of the Office of New Reactors, as appropriate. A proposed alternative must be submitted and authorized prior to implementation. The applicant or licensee must demonstrate that:

(1) The proposed alternative would provide an acceptable level of quality and safety (10 CFR 50.55a(z)(1)), or

(2) Compliance with the specified requirements of this section would result in hardship or unusual difficulty without a compensating increase in quality and safety (10 CFR 50.55a(z)(2)), or

(3) Conformance is impractical for its facility (10 CFR 50.55a(f)(6)(i)).

Based on the above, and subject to the following technical evaluation, the NRC staff finds that regulatory authority exists for the licensee to request, and the Commission to authorize, the alternatives requested by the licensee.

3.0 TECHNICAL EVALUATION

3.0.1 Duration of Relief

WBN, Unit 2, received its operating license on October 22, 2015 (ADAMS Accession No. ML15251A587), is undergoing pre-operational testing, and is expected to enter commercial operation during 2016. TVA desires to combine the WBN Unit 1 and Unit 2 IST programs into one document sharing the same interval start and end dates. ASME OM Code 2004 Edition through 2006 Addenda, Section ISTA-3120(d), "Inservice Test Interval," states that each of the inservice test intervals may be extended or decreased by as much as 1 year. Adjustments shall not cause successive intervals to be altered by more than 1 year from the original pattern of intervals. The WBN, Unit 1, original interval had a start date of May 27, 1996, and end date of May 26, 2007. The WBN, Unit 1, second 10-year IST interval is currently scheduled to end on May 26, 2016.

As stated in TVA's letter dated April 9, 2015, when the WBN, Unit 2, interval date becomes effective after the unit begins commercial operation, TVA will track and document the exact date of commercial operation. The updated IST program for the WBN, Unit, 1 third 10-year interval and the WBN, Unit 2, initial 10-year interval, have been developed to the latest edition and addenda currently referenced by 10 CFR 50.55a(b), which is the ASME OM Code 2004 Edition through the 2006 Addenda. However, if extended delay of the commercial operation date of WBN, Unit 2, were to occur, the initial/baseline IST program for WBN, Unit 2, as well as the third 10-year IST program for WBN, Unit 1, shall be updated to comply with the requirements of the

ASME OM Code incorporated by reference in 10 CFR 50.55a 12 months prior to the commercial date. Also, within 3 months of WBN, Unit 2, commercial operation, TVA will submit a relief request to align the intervals, if required.

3.1 Pump Relief Request IST-RR-1

3.1.1 Licensee's Request

Background

TVA requested relief from ISTB-3300(a) of the ASME OM Code, which requires that initial vibration reference values (Vr) be determined from the results of tests meeting the requirements of ISTB-3100, preservice testing, or from the results of the first inservice test. The relief is requested for the pumps listed in Table 1 below.

Table 1, Pumps Included in Relief Request IST-RR-1

Pump ID	Pump Description	Pump Group	Pump Type (Note 1)
0-PMP-31-36/1-A	Shutdown Board Room Chilled Water (CW) Pump A-A	A	C-H
0-PMP-31-49/1-B	Shutdown Board Room CW Pump B-B	A	C-H
0-PMP-31-80/1-A	Main Control Room CW Pump A-A	A	C-H
0-PMP-31-96/1-B	Main Control Room CW Pump B-B	A	C-H
0-PMP-31-128/1-A	Electrical Board Room CW Pump A-A	A	C-H
0-PMP-31-129/1-B	Electrical Board Room CW Pump B-B	A	C-H
0-PMP-67-28-A	Essential Raw Cooling Water (ERCW) Pump A-A	A	VLS
0-PMP-67-32-A	ERCW Pump B-A	A	VLS
0-PMP-67-36-A	ERCW Pump C-A	A	VLS
0-PMP-67-40-A	ERCW Pump D-A	A	VLS
0-PMP-67-47-A	ERCW Pump E-B	A	VLS
0-PMP-67-51-B	ERCW Pump F-B	A	VLS
0-PMP-67-55-B	ERCW Pump G-B	A	VLS
0-PMP-67-59-B	ERCW Pump H-B	A	VLS
0-PMP-70-51-S	Component Cooling System (CCS) Pump C-S	A	C-H
1-PMP-3-1A-S	Turbine Driven (TD) Auxiliary Feedwater Pump 1A-S	B	C-H
1-PMP-3-118-A	Auxiliary Feedwater Pump 1A-A	A	C-H
1-PMP--3-118-B	Auxiliary Feedwater Pump 1B-B	A	C-H
1-PMP-62-104-A	Centrifugal Charging Pump 1B-B	A	C-H
1-PMP-62-108-B	Centrifugal Charging Pump 1A-A	A	C-H
1-PMP-62-230-A	Boric Acid Transfer Pump 1A-A	A	C-H
1-PMP-62-232-B	Boric Acid Transfer Pump 1B-B	A	C-H
1-PMP-63-10-A	Safety Injection Pump 1A-A	B	C-H
1-PMP-63-15-B	Safety Injection Pump 1B-B	B	C-H
1-PMP-67-431-A	ERCW Screen Wash Pump 1A-A	A	VLS
1-PMP-67-440-B	ERCW Screen Wash Pump 1B-B	A	VLS
1-PMP-70-38-B	CCS Pump 1B-B	A	C-H

Pump ID	Pump Description	Pump Group	Pump Type (Note 1)
1-PMP-70-46-A	CCS Pump 1A-A	A	C-H
1-PMP-72-10-B	Containment Spray Pump 1B-B	B	C-H
1-PMP-72-27-A	Containment Spray Pump 1A-A	B	C-H
1-PMP-74-20-A	Residual Heat Removal (RHR) Pump 1A-A	A	C-V
1-PMP-74-20-B	RHR Pump 1B-B	A	C-V
2-PMP-3-2A-S	TD Auxiliary Feedwater Pump 2A-S	B	C-H
2-PMP-3-118-A	Auxiliary Feedwater Pump 2A-A	A	C-H
2-PMP-3-118-B	Auxiliary Feedwater Pump 2B-B	A	C-H
Note 1: C-H: Centrifugal Pump Horizontal – pump and driver are on a horizontal plane. C-V: Centrifugal Pump Vertical – pump and driver are on a vertical plane. VLS: Vertical Line Shaft Pump – a vertical suspended pump where the pump driver and pump element are connected by a line shaft in enclosed column.			

Licensee's Basis for Request

The licensee states that this request applies to the 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.

The licensee states that 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, the licensee proposed to establish a minimum value for Vr of 0.05 ips 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 licensee states that 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.

Licensee's Proposed Alternative

The licensee proposes that 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.

The licensee states that when new reference values are established, the measured parameters will be evaluated for each location to determine if the provisions of this relief request 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.

3.1.2 NRC Staff Evaluation

Subsection ISTB of the 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.

The licensee'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. The licensee 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.

The licensee states that this WBN 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. The licensee 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 NUREG-1482, Revision 2, " Guidelines for Inservice Testing at Nuclear Power Plants: Inservice Testing of Pumps and Valves and Inservice Examination and Testing of Dynamic Restraints (Snubbers) at Nuclear Power Plants – Final Report," Section 5.2, "Smooth-Running Pumps;" 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 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 Pump Relief Request IST-RR-2

3.2.1 Licensee's Request

Background

ISTB-5210, "Preservice Testing," (a), states:

> 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, "Group A Test Procedure," (b), states:

> 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, "Comprehensive Test Procedure," (b), states:

> 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.

The licensee requested relief from the above ASME OM Code paragraphs for the pumps listed in Table 2 below.

Table 2, Pumps Included in Relief Request IST-RR-2

Pump ID	Function	Pump Group	Pump Type (Note 1)
1-PMP-67-431-A	ERCW Screen Wash Pump 1A-A	A	VLS
1-PMP-67-440-B	ERCW Screen Wash Pump 1B-B	A	VLS
2-PMP-67-437-A	ERCW Screen Wash Pump 2A-A	A	VLS
2-PMP-67-447-B	ERCW Screen Wash Pump 2B-B	A	VLS
Note 1: C-H: VLS: Vertical Line Shaft Pump – a vertical suspended pump where the pump driver and pump element are connected by a line shaft in enclosed column.			

Licensee's Basis for Request

The licensee stated that the ERCW screen wash pumps' discharge piping design does not provide permanent in-line instrumentation for 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, and contains several elbows, reducers, and valves prior to entering the traveling screen enclosure. The configuration of this 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.

The licensee stated that 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 visual observation verifying the effectiveness of the flushing operation.

The licensee reviewed the maintenance history for spray nozzle plugging and determined that nozzle plugging is infrequent. The spray nozzles are inspected by operations personnel during spray operation with corrective maintenance initiated as required.

Licensee's Proposed Alternative

The licensee proposes to perform IST for these pumps by setting the system resistance to the same point for each test by placing the throttle valves in the full open position. Differential pressure will be calculated using inlet (based on lake level or suction pressure) and discharge pressure, and flow will not be measured. The spray nozzles, which could affect the system resistance, will be inspected during each test, and corrective actions will be initiated as necessary. With the system resistance maintained constant for each test, pump degradation

will be identified by changes in pump differential pressure, which is calculated using inlet (based upon lake level or suction pressure) and discharge pressures. Vibration readings will be taken at this reference point. The pumps will be tested in this manner for the preservice, Group A, and comprehensive tests.

Instrument accuracy and acceptance criteria for pump differential pressure and vibration will meet the requirements of Table ISTB-3510-1, "Required Instrument Accuracy," and Table ISTB-5221-1, "Vertical Line Shaft and Centrifugal Pumps Test Acceptance Criteria," 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 Group A and comprehensive tests.

In response to a request for information, the licensee stated that for a new ERCW screen wash pump, the bowl assembly will be tested at the vendor's facility, and the test data will be adjusted to account for the pump column. A vendor pump curve will then be developed and provided to the licensee 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.

3.2.2 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 ASME OM 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. The licensee 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. The licensee 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, the licensee 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.

3.3 Valve Relief Request IST-RR-3

3.3.1 Licensee's Request

Background

The following is a list of affected ASME OM Code Requirements:

- ISTC-5151(a), "Valve Stroke Testing," states that, "Active valves shall have their stroke times measured when exercised in accordance with ISCT-3500."

- ISTC-5151(b), "Valve Stroke Testing," states that, "The limiting value(s) of full stroke time of each valve shall be specified by the Owner."

- ISTC-5151(c), "Valve Stroke Testing," states that, "Stroke time shall be measured to at least the nearest second."

- ISTC-5152, "Stroke Test Acceptance Criteria," states that, "Test results shall be compared to reference values established in accordance with ISTC-3300, ISTC-3310, or ISTC-3320."

Alternative testing is requested for the valves listed in Table 3 below.

Table 3, Valves Included in Relief Request IST-RR-3

Valve ID	Function	Category	Class
1-FSV-68-396-B	Reactor Vessel Head Vent	B	2
1-FSV-68-397-A	Reactor Vessel Head Vent	B	2

Licensee Basis for Request

The licensee stated that relief is being requested from measuring stroke times, establishing reference values, comparing stroke times to acceptance criteria/limiting values, and taking corrective action related to stroke time acceptance criteria/limiting values for the reactor vessel head vent (RVHV) throttle valves. In addition, fail-safe testing of these valves will be performed at the same time and frequency as the proposed alternative exercise testing.

The licensee stated that 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, is controlled by the rate at which the thumbwheel controller is moved and is not representative of valve condition. 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.

Licensee Proposed Alternative

The licensee 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. The 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.

The licensee proposes that, 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 will be performed during shutdowns. The test will consist of cycling the valve controller through one complete cycle and verifying (using 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. This action also simulates loss of power and satisfies the fail-safe close test requirement.

B. During refueling outages, in addition to cycling the controller through one complete cycle and using the valve position indicator to verify valve travel, the valve travel will be verified by (a) ensuring no detectable flow is present through the valves with the valves closed, (b) ensuring flow is present when each valve is opened, and (c) ensuring that when each valve is returned to the closed position, no detectable flow is present. The presence or absence of flow will be verified by monitoring a change in a process parameter of 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.

The licensee evaluated an enhanced maintenance program of disassembly and inspection of valve internal parts. The licensee states that 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, the licensee concludes that compliance with the ASME OM Code requirements is impractical, and the proposed alternative provides reasonable assurance of the operational readiness of the RVHV valves.

3.3.2 NRC Staff Evaluation

The RVHV valves 1-FSV-68-396-B and 1-FSV-68-397-A are throttled open manually to provide a RVHV path and vent non-condensable gas 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 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. 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 RVHV throttle valves. Furthermore, the proposed alternative is consistent with previous NRC staff safety evaluations of similar issues for WBN, Unit 1 (ADAMS Accession No. ML070090504, dated March 9, 2007), and WBN, Unit 2 (ADAMS Accession No. ML14289A222, dated October 21, 2014).

4.0 CONCLUSION

As set forth above, the NRC staff determined that the TVA proposed alternative IST-RR-1 provides an acceptable level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all the regulatory requirements set forth in 10 CFR 50.55a(z)(1). Furthermore, the NRC staff determined that it is impractical for the licensee to comply with certain requirements of the ASME OM Code for ERCW screen wash pump testing, and the proposed IST-RR-2 testing specified provides reasonable assurance that the ERCW screen wash pumps will remain operationally ready. The NRC staff also determined that it is impractical for the licensee to comply with certain requirements of the ASME OM Code for the RVHV solenoid valves 1-FSV-68-396-B and 1-FSV-68-397-A, and the proposed alternative of request IST-RR-3 provides reasonable assurance that RVHV solenoid valves 1-FSV-68-396-B and 1-FSV-68-397-A will remain operationally ready. Accordingly, the NRC staff concludes that the licensee has adequately addressed all the regulatory requirements set forth in 10 CFR 50.55a(f)(6)(i). Therefore, the NRC staff authorizes the above proposed alternatives for the third 10-year IST interval at WBN, Unit 1. The third 10 year interval for WBN, Unit 1, is currently scheduled to begin on May 27, 2016. However, the third 10-year IST program interval at WBN, Unit 1, will be adjusted to begin coincident with the start of the first 10-year interval for WBN, Unit 2, upon the start of commercial operation of WBN, Unit 2. Should the start of commercial operation of WBN, Unit 2, be after May 27, 2016, and extend beyond the ASME OM Code limitations for extending the third 10-year IST program interval for WBN, Unit 1, TVA shall submit an additional request for approval.

Granting relief pursuant to 10 CFR 50.55a(z)(1) and 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 requests remain applicable.

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Robert Wolfgang
Michael Farnan

Date: March 10, 2016

Finally, the NRC staff has determined that granting relief pursuant to 10 CFR 50.55a(f)(6)(i) for the third 10-year IST program interval 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 requests remain applicable.

If you have any questions, please contact the project manager, Robert Schaaf, at 301-415-6020 or Robert.Schaaf@nrc.gov.

Sincerely,

/RA/

Benjamin G. Beasley, Branch Chief
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-390

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