March 9, 2007

Mr. Karl W. Singer
Chief Nuclear Officer and
Executive Vice President
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

SUBJECT: WATTS BAR NUCLEAR PLANT, UNIT 1 - REQUESTS FOR RELIEF FOR THE SECOND 10-YEAR PUMP AND VALVE INSERVICE TESTING PROGRAM (TAC NOS. MD2527, MD2528, MD2529, AND MD2530)

Dear Mr. Singer:

By letter dated June 30, 2006, the Tennessee Valley Authority (the licensee), submitted Relief Requests PV-01, PV-02, PV-03, and PV-04 for its second 10-year inservice testing (IST) program interval at the Watts Bar Nuclear Plant, Unit 1 (WBN). On October 20, 2006, the Nuclear Regulatory Commission (NRC) staff requested additional information to support its review. In a letter dated December 11, 2006, the licensee submitted the requested information and also revised Relief Request PV-02.

Based on its evaluation of Relief Request PV-01, the NRC staff authorizes the licensee's proposed alternative pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(a)(3)(i) based on the proposed alternative providing an acceptable level of quality and safety. The proposed alternative is authorized for the second 10-year IST interval at WBN.

Based on its evaluation of Relief Request PV-02, the NRC staff authorizes the licensee's proposed alternative pursuant to 10 CFR 50.55a(f)(6)(i) on the basis that compliance with the American Society of Mechanical Engineers (ASME) Code requirements is impractical, due to the need for significant system modifications, and the proposed alternative provides reasonable assurance of the operational readiness of the essential raw cooling water screen wash pumps. The 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 the licensee that could result if the requirements were imposed on the facility. The proposed alternative is authorized for the second 10-year IST interval at WBN.

Based on its evaluation of Relief Request PV-03, the NRC staff authorizes the licensee's alternative pursuant to 10 CFR 50.55a(f)(6)(i) on the basis that compliance with the ASME Code requirements is impractical and that the proposed alternative provides reasonable assurance of the operational readiness of the reactor coolant head vent throttle valves. The 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 the licensee that could result if the requirements were imposed on the facility. This relief is authorized for the second 10-year IST interval at WBN.

Based on its evaluation of Relief Request PV-04, the NRC staff authorizes the licensee's proposed alternative pursuant to 10 CFR 50.55a(f)(6)(i) on the basis that compliance with the ASME Code requirements is impractical and that the proposed alternative provides reasonable assurance of the operational readiness of solenoid operated valves 0-FSV-67-1221-A and 0-FSV-67-1223-B. The 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 the licensee that could result if the requirements were imposed on the facility. This relief is authorized for the second 10-year IST interval at WBN.

The NRC has completed its review of Relief Requests PV-01, PV-02, PV-03, and PV-04. The enclosed Safety Evaluation contains the NRC staff's evaluation and conclusions.

Sincerely,

/RA/

Margaret H. Chernoff, Acting 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/encl: See next page

consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. This relief is authorized for the second 10-year IST interval at WBN.

Based on its evaluation of Relief Request PV-04, the NRC staff authorizes the licensee's proposed alternative pursuant to 10 CFR 50.55a(f)(6)(i) on the basis that compliance with the ASME Code requirements is impractical and that the proposed alternative provides reasonable assurance of the operational readiness of solenoid operated valves 0-FSV-67-1221-A and 0-FSV-67-1223-B. The 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 the licensee that could result if the requirements were imposed on the facility. This relief is authorized for the second 10-year IST interval at WBN.

The NRC has completed its review of Relief Requests PV-01, PV-02, PV-03, and PV-04. The enclosed Safety Evaluation contains the NRC staff's evaluation and conclusions.

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

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

TENNESSEE VALLEY AUTHORITY

WATTS BAR NUCLEAR PLANT, UNIT 1

DOCKET NUMBER 50-390

1.0 INTRODUCTION

By letter dated June 30, 2006, the Tennessee Valley Authority (TVA, or the licensee) submitted Relief Requests PV-01, PV-02, PV-03 and PV-04 for the second 10-year inservice testing (IST) program interval at its Watts Bar Nuclear Plant, Unit 1 (WBN). The licensee requested relief from certain IST requirements of the 2001 Edition through 2003 Addenda of the American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of Nuclear Power Plants (OM Code, Code). The WBN second 10-year IST interval is scheduled to begin by May 27, 2007. In response to the Nuclear Regulatory Commission (NRC or Commission) staff's request for additional information, the licensee submitted the requested information in a letter dated December 11, 2006, and also revised Relief Request PV-02.

2.0 REGULATORY EVALUATION

Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a, requires 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 incorporated by reference in the regulations, except where alternatives have been authorized or relief has been requested by the licensee. The Commission grants the use of alternatives or relief pursuant to paragraphs (a)(3)(i), (a)(3)(ii), or (f)(6)(i) of 10 CFR 50.55a. 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.

Section 50.55a authorizes the Commission to approve alternatives and to grant relief from ASME Code requirements upon making necessary findings. NRC guidance contained in

Generic Letter (GL) 89-04, "Guidance on Developing Acceptable Inservice Testing Programs," provides alternatives to 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."

The NRC's findings with respect to granting or denying the IST program relief requests are given below.

3.0 TECHNICAL EVALUATION

3.1 Pump Relief Request PV-01

3.1.1 Code Requirements

The licensee requested relief from ISTB-3300(a) which requires that initial vibration reference values be determined from the results of testing meeting the requirements of ISTB-3100, preservice testing, or from the results of the first inservice test. Relief was requested for the following pumps:

Essential Raw Cooling Water Pump 0-PMP-67-28-A
Essential Raw Cooling Water Pump 0-PMP-67-32-A
Essential Raw Cooling Water Pump 0-PMP-67-36-A
Essential Raw Cooling Water Pump 0-PMP-67-40-A
Essential Raw Cooling Water Pump 0-PMP-67-47-B
Essential Raw Cooling Water Pump 0-PMP-67-51-B
Essential Raw Cooling Water Pump 0-PMP-67-55-B
Essential Raw Cooling Water Pump 0-PMP-67-59-B
Essential Raw Cooling Water Screen Wash Pump 1-PMP-67-431-A
Essential Raw Cooling Water Screen Wash Pump 1-PMP-67-440-B
Essential Raw Cooling Water Screen Wash Pump 2-PMP-67-437-A
Essential Raw Cooling Water Screen Wash Pump 2-PMP-67-447-B
Component Cooling Pump 1-PMP-70-46-A
Component Cooling Pump 1-PMP-70-38-A
Component Cooling Pump 0-PMP-70-51-S
Main Control Room Chilled Water Pump 0-PMP-31-80-A
Main Control Room Chilled Water Pump 0-PMP-31-96A-B
Electric Board Room Chilled Water Pump 0-PMP-31-128/1-A
Electric Board Room Chilled Water Pump 0-PMP-31-129/1-B
Shutdown Board Room Chilled Water Pump 0-PMP-31-36/1-A
Shutdown Board Room Chilled Water Pump 0-PMP-31-49/1-B
Boric Acid Transfer Pump 1-PMP-62-230-A
Boric Acid Transfer Pump 1-PMP-62-232-B
Safety Injection Pump 1-PMP-63-10-A
Safety Injection Pump 1-PMP-63-15-B

3.1.2 Licensee's Basis for Requesting Relief

The identified pumps have at least one vibration reference value (Vr) that is currently less than 0.05 inches per second (ips). Small values for Vr produce small acceptable ranges for pump

operation. The acceptable ranges are defined in Tables ISTB-5100-1 and ISTB-5200-1, as 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. Additionally, experience gathered from the preventive maintenance program has shown that changes in vibration levels in the range of 0.05 ips do not normally indicate significant degradation in pump performance.

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

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 0.05 ips, a minimum value of 0.05 ips will be used for Vr, even if the pump is not currently listed above.

In addition to the requirements of ISTB, the pumps in the ASME IST Program are included in the Predictive Maintenance Program. The Predictive Maintenance Program currently employs the following predictive monitoring techniques on an as applicable and as needed basis:

1. vibration monitoring and analysis beyond that required by ISTB,
2. oil sampling and analysis, and
3. thermographic analysis.

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

If the measured parameters are discovered to be outside the normal operating range or to be trending toward an unacceptable degraded state, appropriate actions are taken that may include:

1. increased monitoring to establish rate of change,
2. review of component specific information to identify cause, and
3. removal of the pump from service to perform maintenance.

It should be noted that all of the pumps in the IST Program will remain in the Predictive Maintenance Program even if certain pumps have very low vibration readings and are considered to be smooth running pumps. This alternative to the requirements of ISTB-3300 provides an acceptable level of quality and safety.

3.1.3 Licensee's 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 Code requirements, all pumps in the IST Program are 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 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 0.05 ips, a minimum value of 0.05 ips will be used for Vr even if the pump is not currently listed above.

3.1.4 Evaluation

The 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 Code vibration acceptance criteria to determine if the measured values are acceptable.

Table ISTB-5100-1 and ISTB-5200-1 state that, if during an inservice test, a bearing vibration measurement exceeds 2.5 times Vr, previously established as required by paragraph ISTB 3300, 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 are required by Paragraph ISTB 3300 to be determined when the pump is in good condition.

For pumps whose absolute magnitude of vibration is an order of magnitude below the absolute vibration limits in Table ISTB-5100-1 and ISTB-5200-1, 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 OM Code Subgroup on Pumps has tried numerous times to implement a Code change to establish test requirements for a class of pumps, defined as smooth running. These requirements focused on selecting a minimum vibration to be specified in the proposed Code change, that would assign the minimum reference values. The Code committees have not reached a consensus on the appropriate minimum reference value and on whether this approach would be sufficient to determine degradation in safety related pumps during testing.

In addition, the Code committees had significant discussion on what other types of pump monitoring activities should be included as compensatory requirements for testing of smooth running pumps.

At least one plant has previously been authorized to use the smooth running pump methodology as described above. The minimum reference value was 0.1 ips. However, a pump bearing at this plant experienced significant degradation even though the vibration was below the minimum reference value in the proposed alternative. Had the current Code requirements been in place, the bearing vibration level for this pump would have exceeded the alert range. The degradation was discovered during vibration monitoring for a predictive maintenance program. After this finding, it was clear to the NRC staff that a simple minimum reference value method alone would not be sufficient to determine pump degradation.

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 bearing 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-5100-1 and ISTB-5200-1 will be less than or equal to 0.125 ips and the alert range will be 0.125 to 0.30 ips.

The licensee's proposal also describes the predictive monitoring program for all IST program pumps considered important to safe and reliable plant operation. The licensee states the WBN Predictive Maintenance Program goes beyond the IST requirements for pumps. The program includes the availability of bearing temperature trending for some components, oil sampling and analysis, and thermographic analysis. The licensee 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. The proposed alternative is consistent with the objective of IST which is to determine degradation in safety-related components.

As described above, the NRC staff finds that the alert and required action limits specified in the relief request sufficiently address the previously undetected acute pump problems. The NRC staff assumes that the objective of the licensee's predictive maintenance program is to detect problems involving the mechanical condition, even well in advance of when the pump reaches its overall vibration alert limit.

The licensee has not provided a basis for the proposed alternative to establish a reference value of 0.05 ips. However, as described above, the use of the suggested reference value of 0.05 ips will provide an alert range of 0.125 to 0.30 ips, and the licensee's preventive maintenance program has shown that changes in vibration levels below 0.05 ips do not normally indicate significant degradation in pump performance. The reference value of 0.05 ips is consistent with previous NRC staff safety evaluations of similar issues. This relief request is not for relief from the requirement to establish reference values, but from the method of determining the reference value. Therefore, the licensee's proposed alternative will provide an acceptable level of quality and safety.

3.1.5 Conclusion

Based on the above evaluation, the staff concludes that the licensee's alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(i) based on the alternative providing an acceptable level of

quality and safety. The licensee's proposed alternative is consistent with the objective of IST which is to determine degradation in safety-related components and provides reasonable assurance of operational readiness. Accordingly, the proposed alternative is authorized for the second 10-year IST interval at WBN.

3.2 Pump Relief Request PV-02

3.2.1 Code Requirements

The licensee requested relief from ISTB-5121(b) which requires that system resistance be varied until the flow rate equals the reference point. Specific relief was requested from the requirement to measure flow rate during Group A and biennial comprehensive tests. Relief was requested for the following essential raw cooling water (ERCW) screen wash pumps:

A-A Essential Raw Cooling Water Screen Wash Pump
B-B Essential Raw Cooling Water Screen Wash Pump
D-A Essential Raw Cooling Water Screen Wash Pump
C-B Essential Raw Cooling Water Screen Wash Pump

3.2.2 Licensee's Basis for Requesting Relief

No in-line instrumentation exists to measure flow and the physical configuration of the pump 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 nor representative of actual pump flow. 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 testing the effectiveness of the flushing operation.

WBN plans to perform the test 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 nozzle plugging and it was determined that nozzle plugging is infrequent. The 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 both the quarterly Group A and the biennial Comprehensive test.

3.2.3 Licensee's Proposed Alternative Testing

System resistance will be set to the same point for each test with the throttle valves full open. Flow will not be measured. 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. With system resistance maintained constant for each test, pump degradation will be identified through changes in differential pressure. The pump will be trended for degradation based on differential pressure at this point. Vibration readings will also be taken at this reference point as well. The pumps will be tested in this manner for both the quarterly Group A test and the biennial Comprehensive test.

3.2.4 Evaluation

No in-line instrumentation exists to measure flow and the physical configuration of the pump 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 nor representative of actual pump flow. Significant system modifications, such as piping rerouting and support redesign, would be required to obtain a configuration that would provide reliable flow readings. Based on the above, the staff finds that compliance with the Code requirements is impractical.

The licensee plans to perform pump testing 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 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 can be identified and trended through changes in differential pressure. The proposed alternative 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 the ERCW screen wash pumps.

3.2.5 Conclusion

Based on the above evaluation, the staff concludes that the licensee's alternative is authorized pursuant to 10 CFR 50.55a(f)(6)(i) on the basis that compliance with the Code requirements is impractical, due to the need for significant system modifications, and the licensee's proposed alternative provides reasonable assurance of the operational readiness of the ERCW screen wash pumps. Accordingly, the proposed alternative is authorized for the second 10-year IST interval at WBN.

3.3 Valve Relief Request PV-03

3.3.1 Code Requirements

The licensee requested relief from ISTC-5151 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 vent valves:

1-FSV-68-396-B
1-FSV-68-397-A (1-47W813-1)

3.3.2 Licensee's Basis for Requesting Relief

The reactor coolant system head vent throttle valves are throttled open manually by main control room operator action to (1) provide a reactor vessel head vent path; (2) vent non-condensables 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), one-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, 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.

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

1. 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.

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

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

1. 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 valves electrical terminal board] in accordance with TVA's environmental qualification binder for the valve. The current schedule for valve part replacement is every 132 months for the LVDT, every 294 months for the coil, and every 432 months for the valve terminal board.

2. 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:

1. 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.

2. 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.

3.3.3 Licensee's Proposed Alternative Testing

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

1. 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 valves electrical terminal board] in accordance with TVA's environmental qualification binder for the valve.

2. 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:

1. 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.

2. 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.

3.3.4 Evaluation

The reactor coolant head vent throttle valves 1-FSV-68-396-B and 1-FSV-68-397-A are throttled open manually to provide a reactor vessel head vent path and vent non-condensables from the head during an accident to promote natural circulation. The 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), one-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, 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 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 licensee's proposed alternative provides reasonable assurance of the operational readiness of the reactor coolant head vent throttle valves.

3.3.5 Conclusion

Based on the above evaluation, the staff concludes that the licensee's alternative is authorized pursuant to 10 CFR 50.55a(f)(6)(i) on the basis that compliance with the Code requirements is impractical and that the alternative provides reasonable assurance of the operational readiness of the reactor coolant head vent throttle valves. The 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 the licensee that could result if the requirements were imposed on the facility. Accordingly, relief is authorized for the second 10-year IST interval at WBN.

3.4 Valve Relief Request PV-04

3.41 Code Requirements

The licensee requested relief from ISTC-5151 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 ERCW valves:

0-FSV-67-1221-A (1-47W845-4)
0-FSV-67-1223-B (1-47W845-7)

3.4.2 Licensee's Basis for Requesting Relief

These solenoid valves are mounted on the auxiliary air compressor skid. They are totally enclosed, solenoid actuated valves manufactured by Target Rock and have no remote position indication capability. The inability to see any moving parts of the valve combined with the lack of remote position indication capability prevents visual confirmation of valve position, thus preventing direct measurement of the stroke time of the valve.

Additionally, the air compressors have a thermostatic valve installed in series with these solenoid valves that modulates in response to system temperature. The thermostatic valve does not start opening until air compressor temperatures are elevated. Until air compressor temperatures have risen sufficiently to open the thermostat, no cooling water flow exists to the compressor, even though the solenoid valves are open. Although a flow element is provided in the cooling water line, the presence of the thermostatic valve prevents use of the onset of flow as an indirect indication of solenoid valve stroke time.

As discussed in NUREG-1482, Revision 1, Section 3.4, when an individual component cannot be tested to the requirements of ISTC, testing of the larger component ensures that the subcomponent is functioning properly. Demonstration of the ability of the auxiliary air compressors to operate without overheating will provide an adequate means of assuring operational readiness of cooling water supply valves 0-FSV-67-1221-A and 0-FSV-67-1223-B.

3.4.3 Licensee's Proposed Alternative Testing

The valves will be exercised to the open position quarterly by operating the auxiliary air compressor and observing the discharge air and jacket water temperature during compressor operation to ensure the temperatures are maintained at acceptable levels. This verifies that the ERCW supply solenoid valves operate to supply cooling water to the auxiliary air compressors.

3.4.4 Evaluation

Valves 0-FSV-67-1221-A and 0-FSV-67-1223-B are solenoid operated valves mounted on the auxiliary air compressor skid. The valves are totally enclosed, solenoid actuated valves manufactured by Target Rock and have no remote position indication capability. The inability to see any moving parts of the valve combined with the lack of remote position indication capability prevents visual confirmation of valve position, thus preventing direct measurement of the stroke time of the valve. Based on the above considerations the staff considers that stroke time testing of the valves is impractical.

The licensee proposes to exercise the valves to the open position quarterly by operating the auxiliary air compressor and observing the discharge air and jacket water temperature during compressor operation to ensure the temperatures are maintained at acceptable levels. This verifies that the cooling water supply solenoid valves operate to supply cooling water to the auxiliary air compressors.

NUREG 1482, Revision 1, Section 3.4 addresses the issue of skid mounted components. The staff has determined that the testing of the major component is an acceptable means of verifying the operational readiness of skid mounted and component subassemblies. The licensee's proposed alternative is consistent with the staff's guidance in NUREG-1482 and provides reasonable assurance of the operational readiness of the solenoid operated valves.

3.4.5 Conclusion

Based on the above evaluation, the staff concludes that the licensee's alternative is authorized pursuant to 10 CFR 50.55a(a)(6)(i) on the basis that compliance with the Code requirements is impractical and that the alternative provides reasonable assurance of the operational readiness of solenoid operated valves 0-FSV-67-1221-A and 0-FSV-67-1223-B. The 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 the licensee that could result if the requirements were imposed on the facility. Accordingly, relief is authorized for the second 10-year IST interval at WBN.

4.0 CONCLUSION

Based on the discussion in Section 3.0 above, the NRC staff concludes that the licensee's proposed alternatives in Relief Requests PV-01, PV-02, PV-03 and PV-04 may be authorized for the second 10-year IST interval at WBN.

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