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

May 12, 2016

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

SUBJECT: SEQUOYAH NUCLEAR PLANT, UNITS 1 AND 2 – RELIEF REQUESTS RP-01, RP-02, RP-04, RP-06, RP-08, AND RV-01 RELATED TO THE INSERVICE TESTING PROGRAM, FOURTH 10-YEAR INTERVAL (CAC NOS. MF7099 AND MF7100)

Dear Mr. Shea:

By letter dated November 18, 2015, Agencywide Documents Access and Management System Accession No. ML15322A241, Tennessee Valley Authority (the licensee) submitted Relief Requests RP-01, RP-02, RP-04, RP-06, RP-08, and RV-01 to the Nuclear Regulatory Commission (NRC). These requests are applicable to the fourth 10-year inservice testing (IST) program interval at Sequoyah Nuclear Plant (SQN), Units 1 and 2. The licensee requested an alternative test plan in lieu of certain inservice testing (IST) requirements of the 2004 Edition through 2006 Addenda of the American Society of Mechanical Engineers (ASME) *Code for Operation and Maintenance of Nuclear Power Plants* (OM Code) for the IST program at SQN Units 1 and 2.

Specifically, (1) pursuant to Title 10 of the *Code of Federal Regulations (*10 CFR) Part 50, Section 55a(f)(5)(iii), the licensee requested to use proposed alternatives RP-02 and RV-01 on the basis that complying with the IST requirements is impractical; (2) pursuant to 10 CFR 50.55a(z)(1), the licensee requested to use proposed alternatives RP-04 and RP-08 on the basis that the alternatives provide an acceptable level of quality and safety; and (3) pursuant to 10 CFR 50.55a(z)(2), the licensee requested to use the proposed alternatives in RP-01 and RP-06, since complying with the current ASME OM Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

The NRC staff has determined that for requests RP-02 and RV-01, granting relief pursuant to 10 CFR 50.55(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. The proposed testing alternative provides reasonable assurance that the components listed in Tables 2 and 6 of the Enclosure are operationally ready.

The NRC staff has determined that requests RP-04 and RP-08 provide an acceptable level of quality and safety for components listed in Tables 3 and 5 of the Enclosure. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(1).

The NRC staff has determined that the proposed alternatives RP-01 and RP-06 provide reasonable assurance that the affected components listed in Tables 1 and 4 of the Enclosure are 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(a)(z)(2).

Therefore, the NRC staff authorizes the proposed alternatives in RP-01, RP-04, RP-06, RP-08, and grants relief for requests RP-02 and RV-01 for the Fourth 10-Year IST interval at SQN Units 1 and 2, which is currently scheduled to begin on June 1, 2016, and end on May 31, 2026.

All other ASME OM Code requirements for which relief was not specifically requested and approved in the subject requests for relief remain applicable.

If you have any questions, please contact the Project Manager, Andrew Hon, at 301-415-8480 or Andrew.Hon@nrc.gov.

Sincerely,

Benjamin G. Beasley

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

Docket Nos. 50-327 and 50-328

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

RELIEF REQUESTS RP-01, RP-02, RP-04, RP-06, RP-08, AND RV-01

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

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR PLANT UNITS 1 & 2

DOCKET NOS. 50-327 AND 50-328

1.0 INTRODUCTION

By letter dated November 18, 2015, Agencywide Documents Access and Management System (ADAMS) Accession No. ML15322A241, Tennessee Valley Authority (TVA, the licensee) submitted relief requests RP-01, RP-02, RP-04, RP-06, RP-08, and RV-01 to the Nuclear Regulatory Commission (NRC). These requests are applicable to the fourth 10-year inservice testing (IST) program interval at Sequoyah Nuclear Plant (SQN), Units 1 and 2. The licensee requested an alternative test plan in lieu of certain IST requirements of the 2004 Edition through 2006 Addenda of the American Society of Mechanical Engineers (ASME) *Code for Operation and Maintenance of Nuclear Power Plants* (OM Code) for the IST program at SQN Units 1 and 2.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Section 55a(f)(5)(iii), the licensee requested to use proposed alternatives RP-02 and RV-01 on the basis that complying with the IST requirements is impractical.

Specifically, pursuant to 10 CFR 50.55a(z)(1), the licensee requested to use proposed alternatives RP-04 and RP-08 on the basis that the alternatives provide an acceptable level of quality and safety.

Specifically, pursuant to 10 CFR 50.55a(z)(2), the licensee requested to use the proposed alternatives in RP-01 and RP-06, since complying with the current ASME OM Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

2.0 REGULATORY EVALUATION

It states, in part, in 10 CFR 50.55a(f), "Inservice Testing Requirements," 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

Enclosure

where alternatives have been authorized or relief has been granted by the NRC pursuant to 10 CFR 50.55a(z)(1), 10 CFR 50.55a(z)(2), or 10 CFR 50.55a(f)(6)(i).

In proposing alternatives or requesting relief, the licensee must demonstrate that (1) the proposed alternatives provide an acceptable level of quality and safety (10 CFR 50.55a(z)(1)); (2) compliance would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety (10 CFR 50.55a(z)(2)); or (3) conformance is impractical for its facility (10 CFR 50.55a(f)(6)(i)). Section 50.55a allows the NRC to authorize alternatives and to grant relief from ASME OM Code requirements upon making necessary findings.

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 alternative requested by the licensee.

3.0 TECHNICAL EVALUATION

3.0.1 Applicable ASME OM Code

The following requests are alternative test plans in lieu of certain IST requirements of the 2004 Edition through 2006 Addenda of the ASME OM Code for the IST program at SQN Units 1 and 2 for the fourth 10-year IST interval currently scheduled to start June 1, 2016, and end on May 31, 2026.

3.1.1 Licensee's Relief Request RP-01

ASME OM Code Requirements:

ISTB-5210(a) "Preservice Testing," states that "In systems where resistance can be varied, flow rate and differential pressure shall be measured at a minimum of five points. If practicable, these points shall be from pump minimum flow to at least pump design flow. A pump curve shall be established based on 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 resistance cannot be varied."

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

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

Alternative testing is requested for the following pumps:

Table 1			
Pump ID	**Function**	**Group**	**Class**
0-PMP-67-470	Essential Raw Cooling Water (ERCW) Screen Wash Pump A-A	A	3
0-PMP-67-477	ERCW Screen Wash Pump B-B	A	3
0-PMP-67-482	ERCW Screen Wash Pump C-B	A	3
0-PMP-67-487	ERCW Screen Wash Pump D-A	A	3

The licensee states in part:

Reason for Request:

The configuration of the Essential Raw Cooling Water (ERCW) Screen Wash Pump discharge 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. The lack of permanent or temporary flow instrumentation makes it impractical to adjust pump flow to specific value(s) and measure the associated differential pressure as required for performance of Preservice, Group A, and comprehensive pump tests. Significant system modifications, such as piping rerouting and support redesign, would be required to obtain a configuration that would provide reliable flow readings.

Proposed Alternative

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 condition of the spray nozzles. The condition of the spray nozzles will be inspected during each test performance with corrective action initiated as necessary, thus providing assurance that the condition of the spray nozzle 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 on lake level or suction pressure) and discharge 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. The pump will be tested in this manner for the Preservice Test, the quarterly Group A, and biennial comprehensive inservice tests.

Instrument accuracy and acceptance criteria for pump differential pressure and vibration will meet the requirements of Table ISTB-3510-1 and Table ISTB-5221-1, respectively. Preservice test data for differential pressure and vibration data will be evaluated to verify it represents acceptable pump operation and will be used as reference values for subsequent quarterly Group A and comprehensive inservice tests.

3.1.2 NRC Staff Evaluation

ERCW Screen Wash Pumps 0-PMP-67-470, 0-PMP-67-477, 0-PMP-67-482, and 0-PMP-67-487 are vertical line shaft centrifugal pumps and considered to be Group A as defined by the ASME OM Code, which states that Group A pumps are "pumps that are operated continuously or routinely during normal operation, cold shutdown, or refueling operations." The ASME OM Code requires Group A vertical line shaft pumps to be tested quarterly by test procedure ISTB-5221 and tested biennially by the comprehensive test procedure ISTB-5223. Both tests require that the pump operate at a specific flow reference point. However, 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 piping system configuration does not provide straight lengths of pipe that will support 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 would be required to obtain a configuration suitable for providing reliable flow readings.

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. With system resistance maintained constant for each test, pump degradation can be identified and trended through changes in differential pressure and overall pump vibration.

The NRC staff finds that compliance with the Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety and that 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.

3.2.1 Licensee's Relief Request RP-02

ASME OM Code Requirements:

ISTB-5121 "Group A Test Procedure" states that "Group A tests shall be conducted with the pump operating at a specified reference point. The test parameters shown in Table ISTB-3000-1 shall be determined and recorded as required by this paragraph. The test shall be conducted as follows:"

ISTB-5121(b) "Group A Test Procedure" states that "The resistance of the system shall be varied until the flow rate equals the reference point. The differential pressure shall then be determined and compared to its reference value. Alternatively, the flow rate shall be varied until the differential pressure equals the reference point and the flow rate determined and compared to the reference flow rate value."

ISTB-5121(e) "Group A Test Procedure" states in part that "All deviations from the reference values shall be compared with the ranges of Table ISTB-5121-1 and corrective action taken as specified in ISTB-6200."

Alternative testing is requested for the following pumps:

Table 2			
Pump ID	**Function**	**Group**	**Class**
1-PMP-74-10	Residual Heat Removal (RHR) Pump 1A-A	A	2
1-PMP-74-20	RHR Pump 1B-B	A	2
2-PMP-74-10	RHR Pump 2A-A	A	2
2-PMP-74-20	RHR Pump 2B-B	A	2

The licensee states in part:

Reason for Request:

Residual Heat Pump (RHR) pumps are tested using the minimum flow recirculation line provided for pump protection. No other flow path is available to meet the Group A quarterly testing of ISTB. The mini flow path is of fixed resistance, instrumented, and limits flow to the minimum required flow for pump protection. The nominal mini flow rate is 500 gpm [gallons per minute] for pump protection.

Test results during previous ten-year inspection intervals have shown variations of recorded flow readings which exceed ISTB allowable range requirements. The RHR pump mini flow rate is measured using an installed flow measuring device in the 14-inch pump discharge header while flowing through the 3-inch mini flow line which includes a 2-inch mini flow return valve. The flow measuring device meets ISTB range and accuracy requirements, however, small changes in the differential pressure across the flow element equate to relatively large changes in the flow. A differential pressure change of two-inches of water at the flow element would equal a 44 gpm change in flow.

With the configuration of the installed flow instrumentation and the resulting negligible effect that changes in the flow have on differential pressure while operating on minimum flow path, maintaining compliance to ISTB specified flow ranges is not practical. Additionally, TVA considered performing testing during cold shutdowns and determined it is not practical to perform testing during cold shutdown as the RHR system is typically inservice and relied upon for heat removal and safe operation of the plant. Flow adjustments for testing purposes could affect safe plant operation in maintaining the plant while in the cold shutdown state.

Proposed Alternative

The RHR Pumps will be Group A tested quarterly using the minimum flow recirculation line where differential pressure and vibration will be measured and trended. The RHR Pumps will be subjected to a Comprehensive Pump test in accordance with ISTB requirements each refueling outage.

3.2.2 NRC Staff Evaluation

RHR pumps 1-PMP-74-10, 1-PMP-74-20, 2-PMP-74-10, and 2-PMP-74-20 are centrifugal pumps and considered to be Group A as defined by the ASME OM Code, which states that Group A pumps are "pumps that are operated continuously or routinely during normal operation, cold shutdown, or refueling operations." The ASME OM Code requires Group A centrifugal pumps to be tested quarterly by test procedure ISTB-5121 and tested biennially by the comprehensive test procedure ISTB-5123. Both tests require that the pump operate at a specific flow reference point. Due to the design of the RHR system, the RHR pumps quarterly test is performed using a fixed resistance recirculation flow path. The nominal flow rate through the recirculation flow path is 500 gpm. This flow rate is in the flat portion of the pump curve near shutoff head conditions. In this region, small changes in the developed head result in large changes of flow that make it difficult to achieve the acceptable range requirement of the OM Code.

During normal plant operation, it is impractical for the licensee to test using the normal flow path due to the design of the RHR system. Test results during previous 10-year inspection intervals have shown variations of recorded flow readings that exceed OM Code ISTB allowable range requirements. The flow measuring device meets OM Code ISTB range and accuracy requirements, however, small changes in the differential pressure across the flow element equate to relatively large changes in the flow. The licensee's alternative meets the guidance contained in NUREG-1482, Revision 2 "Guidelines for Inservice Testing at Nuclear Power Plants," Section 5.9 "Pump Testing Using Minimum Flow Return Lines With or Without Flow Measuring Devices." The licensee's alternative to test quarterly using the mini flow recirculation line measuring differential pressure and vibration, and test at a substantial flow rate during refueling shutdowns measuring flow rate, differential pressure and vibration, provides reasonable assurance of the operational readiness of the RHR pumps.

3.3.1 Licensee's Relief Request RP-04

ASME OM Code Requirements:

ISTB-3300(a) "Reference Values" states that "Initial reference values shall be determined from the results of testing the requirements of ISTB-3100, Preservice Testing, or from the results of the first inservice test."

ISTB-5121(e) "Group A Test Procedure" states that "All deviations from the reference values shall be compared with the ranges of Table ISTB-5121-1 and corrective action taken as specified in ISTB-6200. Vibration measurements shall be compared to both the relative and absolute criteria shown in the alert and required action ranges of Table ISTB-5121-1. For example, if vibration exceeds either $6V_r$ [vibration reference value], or 0.7 in./sec (1.7 cm/sec) the pump is in the required action range."

ISTB-5123(e) "Comprehensive Test Procedure" states that "All deviations from the reference values shall be compared with the ranges of Table ISTB-5121-1 and corrective action taken as specified in ISTB-6200. The vibration measurements shall be compared to both the relative and absolute criteria shown in the alert and required action ranges of Table ISTB-5121-1. For

example, if vibration exceeds either $6V_r$, or 0.7 in./sec (1.7 cm/sec) the pump is in the required action range."

ISTB-5221(e) "Group A Test Procedure" states that "All deviations from the reference values shall be compared with the ranges of Table ISTB-5221-1 and corrective action taken as specified in ISTB-6200. Vibration measurements shall be compared to both the relative and absolute criteria shown in the alert and required action ranges of Table ISTB-5221-1. For example, if vibration exceeds either $6V_r$, or 0.7 in./sec (1.7 cm/sec) the pump is in the required action range."

ISTB-5223(e) "Comprehensive Test Procedure" states that "All deviations from the reference values shall be compared with the ranges of Table ISTB-5221-1 and corrective action taken as specified in ISTB-6200. The vibration measurements shall be compared to both the relative and absolute criteria shown in the alert and required action ranges of Table ISTB-5221-1. For example, if vibration exceeds either $6V_r$, or 0.7 in./sec (1.7 cm/sec) the pump is in the required action range."

ISTB-5122(d) "Group B Test Procedure" states that "All deviations from the reference values shall be compared with the ranges of Table ISTB-5121-1 and corrective action taken as specified in ISTB-6200."

ISTB-5222(d) "Group B Test Procedure" states that "All deviations from the reference values shall be compared with the ranges of Table ISTB-5221-1 and corrective action taken as specified in ISTB-6200."

Alternative testing is requested for the following pumps:

Table 3

Pump ID	Function	Group	Class
0-PMP-67-432	Essential Raw Cooling Water Pump (ERCWP)	A	3
0-PMP-67-436	ERCWP	A	3
0-PMP-67-440	ERCWP	A	3
0-PMP-67-444	ERCWP	A	3
0-PMP-67-452	ERCWP	A	3
0-PMP-67-456	ERCWP	A	3
0-PMP-67-460	ERCWP	A	3
0-PMP-67-464	ERCWP	A	3
0-PMP-70-51	Component Cooling Water Pump (CCWP)	A	3
1-PMP-70-38	CCWP	A	3
1-PMP-70-46	CCWP	A	3
2-PMP-70-33	CCWP	A	3
2-PMP-70-59	CCWP	A	3
0-PMP-313-303	Shutdown Board Room Chilled Water Pump (SBRCWP)	A	3
0-PMP-313-338	SBRCWP	A	3
1-PMP-62-230	Boric Acid Transfer Pump (BATP)	A	3
1-PMP-62-232	BATP	A	3

Table 3			
Pump ID	**Function**	**Group**	**Class**
2-PMP-62-230	BATP	A	3
2-PMP-62-232	BATP	A	3
1-PMP-63-10	Safety Injection Pump (SIP)	B	2
1-PMP-63-15	SIP	B	2
2-PMP-63-10	SIP	B	2
2-PMP-63-15	SIP	B	2
1-PMP-72-10	Containment Spray Pump (CSP)	B	2
1-PMP-72-27	CSP	B	2
2-PMP-72-10	CSP	B	2
2-PMP-72-27	CSP	B	2
1-PMP-3-118	Auxiliary Feedwater (Motor) Pump (AFMP)	A	3
1-PMP-3-128	AFMP	A	3
2-PMP-3-118	AFMP	A	3
2-PMP-3-128	AFMP	A	3
0-PMP-67-470	ERCW Screen Wash Pump A-A (ERCWSWP)	A	3
0-PMP-67-477	ERCWSWP B-B	A	3
0-PMP-67-482	ERCWSWP C-B	A	3
0-PMP-67-487	ERCWSWP D-A	A	3
1-PMP-3-142	Auxiliary Feedwater (Steam) Pump (AFSP)	B	3
2-PMP-3-142	AFSP	B	3
1-PMP-62-104	Centrifugal Charging Pump (CCP)	A	2
1-PMP-62-108	CCP	A	2
2-PMP-62-104	CCP	A	2
2-PMP-62-108	CCP	A	2
1-PMP-74-10	Residual Heat Removal Pump (RHRP)	A	2
1-PMP-74-20	RHRP	A	2
2-PMP-74-10	RHRP	A	2
2-PMP-74-20	RHRP	A	2

The licensee states in part:

Reason for Request:

Relief is being requested for establishing a vibration reference value (V_r) because the data collected during preservice or inservice testing for those vibration points that have unusually low levels of vibration (smooth running pumps). This request applies only to values for V_r associated with vibration testing. Small values for V_r result in small acceptable ranges for pump operation. The acceptable range defined in Table ISTB-5121-1 and Table ISTB-5221-1 is less than or equal to $2.5V_r$. 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 list of affected components for his relief request, as approved by the NRC for the third ten-year interval, was expanded to include all pumps in the IST program. This will allow

for application of this relief to those pumps with measured V_r less than or equal to 0.05 inches per second (ips).

Proposed Alternative

Pumps with a measured V_r less than or equal to 0.05 ips for a particular vibration measurement location will 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 relief request still apply. If the measured V_r is greater than 0.05 ips, the requirement of ISTB-3300 will be applied. Conversely, if the measured V_r 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 of the OM code.

3.3.2 NRC Staff Evaluation

The ASME OM Code requires that the vibration of all safety-related pumps be measured. For centrifugal pumps, paragraph ISTB-3540(a) notes that vibration measurements shall be taken in a plane approximately perpendicular to the rotating shaft in two approximately orthogonal directions on each accessible pump-bearing housing. Measurement shall also be taken in the axial direction on each accessible pump thrust bearing housing. These measurements are required to be compared with the ASME OM Code vibration acceptance criteria as specified in Table ISTB-5100-1 to determine if the measured values are acceptable.

Table ISTB-5100-1 show that, if during an inservice test, a vibration measurement on a centrifugal pump exceeds 2.5 times the reference value (V_r), previously established as required by ISTB-3300, the pump is considered to be in the alert range. The frequency of testing is then doubled in accordance with ISTB-6200 until the cause of the deviation is determined, the condition is corrected, and the vibration level returns below the alert range. Pumps, whose vibration is measured at greater than 6 times V_r, are considered to be in the required action range and must be declared inoperable until the cause of the deviation has been determined and the condition is corrected. Per ISTB-3300, the vibration reference values shall be established only when the pump is known to be operating acceptably.

For pumps whose absolute magnitude of vibration is an order of magnitude below the absolute vibration limits in Table ISTB-5100-1, a relatively small increase in vibration magnitude may cause a pump to enter the alert or required action range even though the pump is operating acceptably. The pump may enter these ranges due to variations in flow, instrument accuracies, or other noise sources that would not be associated with degradation of the pump. Pumps that operate with these low vibrations are typically referred to as "smooth running." Since the acceptable range for a "smooth running" pump is so small, the pump could be subjected to unnecessary corrective action due to entry into the alert or action ranges.

The NRC has previously authorized a minimum vibration level of 0.05 ips for "smooth running" pumps at several nuclear plants. However, only monitoring vibration of "smooth running" pumps has been shown to be insufficient for determining pump degradation. At one particular plant, the NRC authorized a minimum reference value of 0.1 ips. A pump bearing at this plant experienced a significant degradation even though the pump vibration levels were below the minimum reference value in the approved alternative. The bearing degradation was discovered during predictive maintenance program activities

The licensee's alternative combines a minimum vibration value of 0.05 ips for "smooth running" pumps with additional monitoring using a predictive maintenance program that includes vibration analysis beyond that required by ASME OM Code, bearing temperature trending, oil analysis, and thermography analysis, as applicable. The licensee notes in their alternative request that if any of the measured parameters, including predictive maintenance values, are outside of 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 a rate of change, review of component specific information to identify the cause of the condition, and removal of the pump from service to perform maintenance. The proposed alternative is consistent with the objectives of the IST, which is to monitor degradation in safety-related components.

Based on the minimum vibration reference value of 0.05 ips noted in this request and the proposed predictive maintenance program, the NRC staff finds that the alert and required action limits specified in the request should address previously undetected pump problems and provide an adequate indication of pump performance. The licensee's predictive maintenance program is designed to detect problems involving unacceptable mechanical conditions in advance of when a smooth running pump may reach the overall vibration alert or action limits. Therefore, the NRC finds that the proposed alternative will provide an acceptable level of quality and safety.

3.4.1 Licensee's Relief Request RP-06

ASME OM Code Requirements:

ISTB-3510(e) "General Frequency Response Range" states that "The frequency response range of the vibration-measuring transducers and their readout system shall be from one-third minimum pump shaft rotational speed to at least 1000 Hz [hertz]."

ISTB-5121(d) "Group A Test Procedure" states that "Vibration (displacement or velocity) shall be determined and compared with the reference value. Vibration measurements shall be broad band (unfiltered). If velocity measurements are used, they shall be peak. If displacement amplitudes are used, they shall be peak-to-peak."

Alternative testing is requested for the following pumps:

Table 4			
Pump ID	**Function**	**Group**	**Class**
1-PMP-74-10	Residual Heat Removal (RHR) Pump 1A-A	A	2
1-PMP-74-20	RHR Pump 1B-B	A	2
2-PMP-74-10	RHR Pump 2A-A	A	2
2-PMP-74-20	RHR Pump 2B-B	A	2

The licensee states in part:

Reason for Request:

TVA proposes to exclude from the ISTB Group A pump test the vibration measurement in the range from one-third up to one-half pump shaft rotational speed. The exclusion of vibration measurements from one-third to one-half minimum pump shaft rotational speed will exclude the readings associated with the natural frequencies as described below. It has been shown that these frequencies do not affect pump performance. Excluding this range of vibration for test measurements would prevent placing the pumps in an "Increased Frequency" test status. Placing SQN's RHR pumps on an increased frequency test status provides no added value for monitoring pump performance. The dominant peak at one-third running speed masks data trending at the frequencies that represent actual pump/motor health.

This results in an unnecessary burden because increasing the test frequency of the pumps would result in additional wear on the equipment and potential challenges to the plant. Pump degradation, due to real physical problems, will be evident with the pump test monitoring the representative pump/motor condition frequencies and without masking the unrelated structural resonant peak. This will ensure appropriate corrective actions are taken to address those levels of vibration that could result in pump degradation.

Proposed Alternative

Vibration measurements of the upper motor bearing of the RHR pumps will be taken during the ISTB Group A pump tests in a range from one-half minimum pump shaft rotational speed to at least 1000 Hz.

Basis for use:

Historical documents for pump performance indicate that a high vibration condition has existed on SQN's RHR pumps since original installation of these pumps. This condition also existed prior to the ASME conversion to the ISTB pump criteria that incorporated an expanded frequency range for measurement of pump vibration (one-third to one-half rotational speed). TVA has monitored this condition for SQN's RHR pumps and concludes there is no degradation of the pump/motor/foundation assembly from the inherent high vibration in this range.

Westinghouse Electric Company (Westinghouse), provider of SQN's RHR pumps, issued Technical Bulletin NSID-TB-86-02 Revision 1, "Vibration Motor Resonant Vibration - Residual Heat Removal Pumps," dated September 23, 1986, that advised utilities of the potential for a high vibration condition in vertical pump/motor/foundation support assemblies. The bulletin references the condition that SQN is experiencing.

In accordance with the vendor recommendations from NSID-TB-86-02, TVA inspected SQN's RHR pumps and pump supports to verify there were no loose supporting connections contributing to the vibration condition. Plant modifications to lower vibration by installing additional supports was not a preferred option based on a concern for relocation of the vibration to other points in the pump/motor/foundation. Attempts to relocate the vibration were found to have limited success at other utilities and in some instances vibration levels were increased.

Analysis of the condition indicates that the vibration occurs in a low frequency range less than one-half rotational speed. Analysis indicates there are no problems with the bearings or rotating elements (i.e., imbalance or misalignment). TVA's request is restricted to those frequencies that exhibit the natural resonance vibration levels. The results and evaluation of TVA's spectral analysis were provided in the original relief request during the second ten-year interval.

Prior to initial operation of either unit, a nonconformance report was written which identified a natural frequency of the RHR pumps of 10 to 11 Hz. At the time, the seismic qualification of the pump had been performed based upon no natural frequencies below 33 Hz. The safety implication was that the RHR pumps did not meet their design basis for seismic qualification. TVA performed design changes and reanalysis of the pump support structure and piping system to qualify the 10 to 11 Hz natural frequency condition. Westinghouse approved the changes.

Both units were shut down for approximately three years beginning in 1985. Both units remained on RHR at shut down cooling flow conditions (greater than 2,000 gallons per minute) in order to maintain the RCS [reactor coolant system] in accordance with the Technical Specifications. During this time, there were no problems with the RHR pumps. The pumps operated continuously with no adverse conditions identified.

Both units at SQN were again shut down in 1993 for approximately one year. During this time, both units remained on RHR with the pumps operating at full flow conditions. The pumps operated continuously with no adverse conditions identified.

TVA has performed advanced vibration diagnostics to assess the condition on all four RHR pumps. The same 10 to 11 Hz natural frequency identified in the late 1970's was identified again. Impact testing was performed on all four RHR pump/motor assemblies.

The testing revealed the following data:

Pump ID	Natural Frequency of Motor Alone	Natural Frequency of Motor and Frame[1]
1A-A	14 to 16 Hz	120 to 350 Hz
1B-B	11 Hz	175 to 331 Hz
2A-A	10 Hz	287 to 356 Hz
2B-B	11 to 13 Hz	100 to 350 Hz
[1]Based on location on the frame		

The testing performed on the 1A RHR pump motor revealed a 14 to 16 Hz response frequency range on the motor. The motor/support frame frequency response is between 120 and 350 Hz. The overall vibration levels on the 1A RHR pump are stable and below the alert range. However, the vibration occurring at the 14 Hz frequency is contributing to the overall levels.

For the 1B and 2A RHR pump motors, this data confirms the previous evaluation that a resonant condition exists at 11 and 10 Hz, respectively. The testing revealed that the motor upper bearing exhibited natural frequencies at approximately 10 and 11 Hz, respectively, which is coincident with the maximum amplitude vibration measurement for the same point found during OM Code quarterly pump testing.

The testing performed on the 2B RHR pump motor revealed a 11 to 13 Hz response frequency range on the motor. The motor support/frame frequency response is between 100 and 350 Hz . The overall vibration levels on 2B RHR pump are stable and below alert range. However, the vibration occurring at the 11 Hz frequency is contributing to the overall levels.

ISTB Group A pump testing is performed with the pump operating on mini flow (the nominal mini flow rate is 500 gpm for pump protection). The pump operation flow characteristics create low frequency flow pulsations which tend to excite the structural resonant frequencies of the machine assembly. Spectra analysis of vibration data collected during pump testing activities indicates a dominant peak between 10 to 14 Hz for all RHR pump motors. To improve the vibration would require separating the low natural frequencies away from the operating frequency of 29.8 Hz. Physical modifications to drive the natural frequency up beyond 30 Hz (greater than 15 percent of operating frequency as a rule of thumb) can be unpredictable and difficult even when performed with detailed analysis. Efforts at other plants have been unsuccessful due to shifting the vibration to adjacent components, such as the pump or piping.

Near full flow vibration data obtained during refueling outages shows that the vibration is greatly reduced at near full flow conditions. This indicates that the higher test measurements occur only during the quarterly tests, which are conducted with the RHR pumps on mini flow. The pumps are designed to run at full-flow conditions for normal plant operations and for accident conditions. Thus, the minimum flow test configuration causes the motor structure to be excited and a higher vibration to be present during the quarterly pump tests.

This testing supports the expected results identified by Westinghouse in Technical Bulletin NSID-TB-86-02.

3.4.2 NRC Staff Evaluation

OM Code ISTB requires that vibration measurements be broad band (unfiltered) and that the frequency response range of the vibration measuring transducers and their readout system be from one-third minimum pump shaft rotational speed to at least 1000 HZ. The licensee proposes to take vibration measurements on the upper motor bearing of the RHR pumps during the quarterly Group A test in a range from one-half minimum pump shaft rotational speed to at least 1000 Hz.

The RHR pumps are tested quarterly using the mini flow recirculation line, and the nominal flow rate is 500 gpm. During refueling outages, the RHR pumps are tested at substantial flow rates and the vibration levels are greatly reduced indicating that the motor structure is excited during low flow conditions present during the quarterly Group A pump test. The pumps are designed to operate at full flow conditions during normal operation of the RHR system and for accident conditions.

Pump operation utilizing the mini flow recirculation line creates low frequency flow pulsations that tend to excite the structural resonant frequencies of the pump assemblies. The natural system frequency can exhibit sufficient force such that when vibration measurements are taken on the upper motor bearing, the readings exceed the OM Code acceptable range limits. However, data from the full flow tests conducted during refueling outages show that the vibration is significantly reduced in this frequency range when operating at significant flow rates and meet the OM Code acceptance criteria. Although the RHR pumps exhibit high vibration during mini flow tests, the spectral analysis indicates that there are no problems with the bearings or rotating elements. TVA has monitored the high vibration condition since original installation of these pumps and has concluded that there is no degradation of the pump/motor/foundation assembly from the inherent high vibration during mini flow tests.

The high vibration levels in the low frequency range during mini flow operation can result in overall vibration levels higher than the OM Code acceptable limits. Exceeding the vibration limits would place the pumps in an increased frequency test status or required action status. However, the pump operation histories and spectral analysis indicates no degradation of the affected components since original installation, and pump operability has been demonstrated during refueling outages by full flow tests. Thus, increasing the test frequency or requiring maintenance on the pumps due to high vibration levels during mini flow operation would not cause an increase in the level of safety or quality in monitoring pump performance.

The pumps are designed to run at full flow conditions, an increased frequency of mini flow tests could result in additional wear on the equipment and potential challenges to the plant, as well as cause unnecessary burden on the licensee. The licensee proposes to exclude the vibration measurements from one-third rotational speed up to one-half rotational speed during the quarterly Group A test. Vibration levels will be monitored from one-half rotational speed to at least 1000 Hz during quarterly pump testing. The frequency response range during comprehensive pump testing will meet the Code requirement of one-third rotational speed to at

least 1000 Hz. The staff finds that compliance with the Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety and that the proposed alternative to monitor vibration from one-half rotational speed to at least 1000 Hz during quarterly pump testing along with a comprehensive pump test that meets Code requirements for vibration monitoring provides reasonable assurance of the operational readiness of the RHR pumps.

3.5.1 Licensee's Relief Request RP-08

ASME OM Code Requirements:

ISTB-3300(e)(1) "Reference Values" states that "Reference values shall be established within ±20% of pump design flow rate for the comprehensive test."

ISTB-3300(e)(2) "Reference Values" states that "Reference values shall be established within ±20% of pump design flow for the Group A and Group B tests, if practicable. If not practicable, the reference point flow rate shall be established at the highest practical flow rate."

ISTB-3400 "Frequency of Inservice Tests" states that "An inservice test shall be run on each pump as specified in Table ISTB-3400-1."

ISTB-3400-1 "Inservice Test Frequency" requires Group A and Group B tests to be performed quarterly and Comprehensive test be performed biennially.

ISTB-3510 "Required Instrument Accuracy" specifies instrument accuracies for Group A, Group B, Comprehensive and Preservice tests.

ISTB-5121-1 "Centrifugal Pump Test Acceptance Criteria" specifies the required acceptance criteria for Group A, Group B, and Comprehensive Tests for centrifugal pumps.

ISTB-5221-1 "Vertical Line Shaft and Centrifugal Pumps Test Acceptable Criteria" specifies the required acceptance criteria for Group A, Group B, and Comprehensive Tests for vertical line shaft centrifugal pumps.

Alternative testing is requested for the following pumps:

Table 5

Pump ID	Function	Group	Class
0-PMP-67-432	Essential Raw Cooling Water Pump (ERCWP)	A	3
0-PMP-67-436	ERCWP	A	3
0-PMP-67-440	ERCWP	A	3
0-PMP-67-444	ERCWP	A	3
0-PMP-67-452	ERCWP	A	3
0-PMP-67-456	ERCWP	A	3
0-PMP-67-460	ERCWP	A	3
0-PMP-67-464	ERCWP	A	3
0-PMP-70-51	Component Cooling Water Pump (CCWP)	A	3

Table 5			
Pump ID	**Function**	**Group**	**Class**
1-PMP-70-38	CCWP	A	3
1-PMP-70-46	CCWP	A	3
2-PMP-70-33	CCWP	A	3
2-PMP-70-59	CCWP	A	3
0-PMP-313-303	Shutdown Board Room Chilled Water Pump (SBRCWP)	A	3
0-PMP-313-338	SBRCWP	A	3
1-PMP-62-230	Boric Acid Transfer Pump (BATP)	A	3
1-PMP-62-232	BATP	A	3
2-PMP-62-230	BATP	A	3
2-PMP-62-232	BATP	A	3
1-PMP-72-10	Containment Spray Pump (CSP)	B	2
1-PMP-72-27	CSP	B	2
2-PMP-72-10	CSP	B	2
2-PMP-72-27	CSP	B	2
0-PMP-67-470	ERCW Screen Wash Pump A-A (ERCWSWP)	A	3
0-PMP-67-477	ERCWSWP B-B	A	3
0-PMP-67-482	ERCWSWP C-B	A	3
0-PMP-67-487	ERCWSWP D-A	A	3

The licensee states in part:

Reason for Request:

The ASME OM Code committee approved Code Case OMN-18, Alternate Testing Requirements for Pumps Tested Quarterly within ±20 percent of Design Flow, which was incorporated into the 2009 edition of the ASME OM Code. This Code Case has not yet been endorsed by the NRC in Regulatory Guide 1.192, Rev 1, Operation and Maintenance Code Case Acceptability, ASME OM Code, August 2014. However, NRC has approved similar relief requests for this Code Case as noted in the Precedents section.

This Code Case allows the elimination of the requirement for the Comprehensive Pump Test (CPT) with its associated acceptance criteria, if the quarterly test is performed at ±20 percent of design flow and the instrumentation meets the accuracy requirements of Table ISTB-3510-1 for the comprehensive and preservice tests. The basis for the testing strategy in this Code Case is that a quarterly Group A pump test, performed at the CPT flow rate with more accurate instrumentation, is more effective in assessing a pump's operational readiness than a standard Group A test in conjunction with a biennial CPT.

ISTB allows the categorization of pumps in the IST program. As such, a pump that otherwise meets the requirements of Group B, could be categorized as a Group A (or AB) pump, and test according to the provisions of Code Case OMN-18. In doing this, additional data (vibration and flow or differential pressure) would be obtained quarterly, rather than once every two years.

As a result of the increased requirements on the parameters imposed by the proposed alternative during applicable quarterly tests, there is no added value in performing the biennial comprehensive test on the affected pumps.

Proposed Alternative

TVA is proposing to utilize the provisions of Code Case OMN-18 and perform a modified Group A test in lieu of performing the code required comprehensive pump test. The modified Group A test will be performed at ±20 percent of design flow. The instrumentation used will meet the accuracy requirements of Table ISTB-3510-1 for the comprehensive and preservice tests. Vibration tests will be performed with the same vibration acceptance criteria as the standard Group A pump test. Additionally, TVA will utilize an acceptable range high limit of 106 percent or lower for quarterly testing.

3.5.2 NRC Staff Evaluation

The ASME OM Code requires that for Group A pumps, a Group A test be performed every quarter, and a CPT be performed biennially. The Group A test is performed within ±20% of the pump design flow rate and the pressure instrument accuracy is ±2%, and the upper limit for the "Acceptable Range" and "Required Action Range" for flow rate and differential pressure is 110% of the reference values. The CPT is performed within ±20% of the pump design flow rate, the pressure instrument accuracy is ±1/2%, and the upper limit of the "Acceptable Range" and "Required Action Range" for flow rate and differential pressure is 103% of the reference values. Vibration monitoring is performed during both the Group A tests and the CPTs.

The licensee proposes that for the pumps listed in Table 5, a modified Group A quarterly test will be performed using ASME OM Code Case OMN-18, with modified "Acceptable" and "Required Action" ranges, and the biennial comprehensive test will not be performed. The modified Group A quarterly test would be performed within ±20% of the pump design flow rate, using more accurate pressure instrumentation that is required for a comprehensive test (±1/2% instead of ±2%). The licensee will use a more limiting upper bound differential pressure (ΔP) value of 106% for the "Acceptable Range" in lieu of 110% that is normally required by the ASME OM Code for Group A tests. However, the upper bound 106% is greater than the upper bound value of 103% for the biennial CPT. Using more accurate pressure gauges and a more limiting "Acceptable Range" during modified quarterly Group A test compensates for the elimination of the CPT with its more limiting "Acceptable Range" upper bound value of 103%.

OMN-18 was published in the 2009 Edition of the ASME OM Code. This edition of the ASME OM Code has not been incorporated by reference into 10 CFR 50.55a, and OMN-18 has not been incorporated into Regulatory Guide (RG) 1.192. However, the NRC staff has reviewed OMN-18, and currently has no concerns with its usage, providing that the upper end values of the Group A test "Acceptable Ranges" for flow (Q) and differential pressure (ΔP) are 106%Q_r and 106%ΔP_r respectively, and the high values of the "Required Action Ranges" for flow and differential pressure are greater than 106%Q_r and 106%ΔP_r respectively. The NRC staff considers the proposed alternative acceptable because all of the tests will be performed with pressure gauges with ±1/2% accuracy. The elimination of the CPT, with its more limiting "Acceptable Range" upper bound of 103%ΔP_r, is compensated for by using more accurate pressure gauges on every quarterly test. Regular testing with more accurate instrumentation

and tighter acceptance criteria will provide for better trending of pump performance. Therefore, the NRC finds that the proposed alternative provides an acceptable level of quality and safety for testing and acceptance criteria for the pumps listed in Table 5.

3.6.1 Licensee's Relief Request RV-01

ASME OM Code Requirements:

ISTC-3300 "Reference Values" states in part that "Reference values shall be determined from the results of preservice testing or from the results of inservice testing. These tests shall be performed under conditions as near as practicable to those expected during subsequent inservice testing."

ISTC-3310 "Effect of Valve Repair, Replacement, or Maintenance on Reference Values" states in part that "When a valve or its control system has been replaced, repaired, or has undergone maintenance that could affect the valve's performance, a new reference value shall be determined or the previous value reconfirmed by an inservice test run before the time it is returned to service or immediately if not removed from service."

ISTC-3510 "Exercising Test Frequency" states in part that "Active Category A, Category B, and Category C check valves shall be exercised nominally every three months, except as provided by ISTC-3520, ISTC-3540, ISTC-3550, ISTC-3570, ISTC-5221, and ISTC-5222."

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

ISTC-5151(b) "Valve Stroke Testing" states that "The limiting values(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-5151(d) "Valve Stroke Testing" states that "Any abnormality or erratic action shall be recorded (see ISTC-9120), and an evaluation shall be made regarding need for corrective action."

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

ISTC-5152(a) "Stroke Time Acceptance Criteria" states that "Valves with reference stroke times of greater than 10 seconds shall exhibit no more than ±25% change in stroke time when compared to the reference value."

ISTC-5152(b) "Stroke Time Acceptance Criteria" states that "Valves with reference stroke times of less than or equal to 10 sec shall exhibit no more than ±50% change in stroke time when compared to the reference value."

ISTC-5152(c) "Stroke Time Acceptance Criteria" states that "Valves that stroke in less than

2 sec may be exempted from ISTC-5152(b). In such cases the maximum limiting stroke time shall be 2 sec.

ISTC-5153(a) "Stroke Test Corrective Action" states that "If a valve fails to exhibit the required change in obturator position or exceeds the limiting values of full-stroke time [see ISTC-5151(b)], the valve shall be immediately declared inoperable."

ISTC-5153(b) "Stroke Test Corrective Action" states that "Valves with measured stroke times that do not meet the acceptance criteria of ISTC-5152 shall be immediately retested or declared inoperable. If the valve is retested and the second set of data also does not meet the acceptance criteria, the data shall be analyzed within 96 hr to verify that the new stroke time represents acceptable valve operation, or the valve shall be declared inoperable. If the second set of data meets the acceptance criteria, the cause of the initial deviation shall be analyzed and the results documented in the record of tests (see ISTC-9120)."

Table 6

Valve ID	System	Cat	Class
1-FSV-68-396	Reactor Vessel Head Vent (RVHV)	B	2
1-FSV-68-397	RVHV	B	2
2-FSV-68-396	RVHV	B	2
2-FSV-68-397	RVHV	B	2

The licensee states in part:

Reason for Request:

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 throttle valves.

These solenoid valves have no position indication and are totally enclosed which prevents visual confirmation of the valve position and therefore the inability to measure the time that it takes the valve to stroke. These valves are throttle valves with an operator which positions the valve at 0%, 25%, 50%, and 100%, which is set through the use of a thumbwheel. However, these valves are fast acting valves with a stroke time of less than two seconds and a stroke of approximately 1/4 inch.

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 to allow for the performance of valve stroke time testing.

Proposed Alternative

Verify the valve operates properly through the use of acoustic instrumentation every refueling outage. The acoustic instrumentation takes a signal of the system noise prior to opening the valve. The valve is opened by operating the thumbwheel and another

acoustic signal is obtained at the full open position. The valve is then closed and another acoustic signal is obtained at full closed. The initial acoustic signal at full closed is compared to the second acoustic signal taken at the full closed position. Comparative values provides assurance that the valve is moving to the correct positions and that the valve is operating acceptably. However, the signals do not provide the means to measure the amount of time it takes to go from one position to the other. These valves are one-inch diameter Target Rock valves with a seal welded bonnet. They are the second of two one-inch diameter valves in parallel to each other and are normally closed.

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

1. This process can lead to assembly and operational problems due to distortion of the valve parts caused by the repetitive welding process to reinstall the seal weld every refueling outage. This is not considered acceptable for the purposes of testing and could lead to premature replacement of the valves.

2. The repetitive removal of the seal weld between the body and the bonnet can cause another problem. When the seal weld is removed, a small amount of the base metal also has to be removed in order to find a separation point past the heat affected zone where the weld metal has not penetrated into the base metal so that the bonnet can be removed from the body. Every time this operation is performed, more of the base metal is removed until the required thickness no longer exists which makes the valve nonfunctional.

3. Once the valve is opened and the internals of valve are examined, the condition of the internal parts do not typically give one any more indication of acceptable valve operation than the acoustic monitoring.

Considering that there is no known feasible method for measuring the stroke time and an enhanced maintenance program does not provide additional assurance of acceptable valve operation and can possibly be detrimental to acceptable valve operation, the method described above using acoustical instrumentation provides the only known method from which acceptable valve operation can be determined. A refueling outage is the only time the valves can be monitored and the only time maintenance can be performed because the valves are located inside containment.

3.6.2 NRC Staff Evaluation

The Reactor Vessel Head Vent (RVHV) valves listed in Table 6 are throttled open manually to provide an RVHV 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. Although these are fast acting valves with a typical stroke time of less than 2 seconds, 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 acoustic instrumentation to monitor the full stroke exercise during refueling shutdowns to verify valve travel by performing two consecutive valve strokes while obtaining an acoustic signature of the valve travel. Analysis of the signatures will enable the licensee to assess the valve performance thus ensuring that the valve has completed its full open and full shut capabilities. This verification meets the general exercise requirements of ISTC-3520 and the valve obturator movement requirements of ISTC-3530, which 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 vent throttle valves.

4.0 CONCLUSION

As set forth above, the NRC staff determined that for requests RP-02 and RV-01, granting relief pursuant to 10 CFR 50.55(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. The proposed testing alternative provides reasonable assurance that the components listed in Tables 2 and 6 are operationally ready.

As set forth above, the NRC staff finds that the proposed alternatives described in alternative requests RP-04 and RP-08 provides an acceptable level of quality and safety for components listed in Tables 3 and 5. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(1).

As set forth above, the NRC staff determined that the proposed alternatives RP-01 and RP-06 provide reasonable assurance that the affected components listed in Tables 1 and 4 are 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(a)(z)(2).

All other ASME OM Code requirements for which relief was not specifically requested and approved in the subject requests for relief remain applicable.

Therefore, the NRC staff authorizes the proposed alternatives in RP-01, RP-04, RP-06, RP-08, and grants relief for requests RP-02 and RV-01 for the Fourth 10-Year IST interval at SQN Units 1 and 2, which is currently scheduled to begin on June 1, 2016, and end on May 31, 2026.

Principle Contributor: Michael Farnan, NRR

Date: May 12, 2016

The NRC staff has determined that the proposed alternatives RP-01 and RP-06 provide reasonable assurance that the affected components listed in Tables 1 and 4 of the Enclosure are 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(a)(z)(2).

Therefore, the NRC staff authorizes the proposed alternatives in RP-01, RP-04, RP-06, RP-08, and grants relief for requests RP-02 and RV-01 for the Fourth 10-Year IST interval at SQN Units 1 and 2, which is currently scheduled to begin on June 1, 2016, and end on May 31, 2026.

All other ASME OM Code requirements for which relief was not specifically requested and approved in the subject requests for relief remain applicable.

If you have any questions, please contact the Project Manager, Andrew Hon, at 301-415-8480 or Andrew.Hon@nrc.gov.

Sincerely,

/RA/

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

Docket Nos. 50-327 and 50-328

Enclosure:
Safety Evaluation

cc w/enclosure: Distribution via Listserv

DISTRIBUTION:

PUBLIC	LPL2-2 R/F	RidsNrrDorlLpl2-2
RidsACRS_MailCTR	RidsNrrPMSequoyah	RidsNrrLABClayton
RidsRgn2MailCenter	RidsNrrDeEpnb	MFarnan, NRR
JBowen, OEDO	RidsNrrDorlDpr	RSchaaf, NRR

ADAMS Accession No.:ML16123A131 *by e-mail

OFFICE	DORL/LPL2-2/PM	DORL/LPL2-2/LA	DE/EPNB/BC*	DORL/LPL2-2/BC
NAME	AHon	BClayton	DAlley	BBeasley
DATE	5/9/16	5/10/16	2/16/16	5/12/16

OFFICIAL RECORD COPY