January 28, 2002

Mr. David A. Christian
Senior Vice President
and Chief Nuclear Officer
Virginia Electric and Power Company
Innsbrook Technical Center
5000 Dominion Blvd.
Glen Allen, Virginia 23060-6711

SUBJECT: NORTH ANNA POWER STATION, UNITS 1 AND 2 RE: INSERVICE TESTING PROGRAM FOR PUMP AND VALVES, THIRD TEN YEAR INTERVAL UPDATE (TAC NOS. MB2221 AND MB2222)

Dear Mr. Christian:

The purpose of this letter is to disposition the 12 requests for reliefs you submitted for North Anna Power Station, Units 1 and 2, related to the inservice testing (IST) program third 10-year interval. Of the 12 requests, 11 have been granted, and one was withdrawn as requested in your submittal.

By letter dated June 4, 2001, as supplemented by letter dated October 25, 2001, Virginia Electric and Power Company (VEPCO) submitted 12 requests for relief from the American Society of Mechanical Engineers Code requirements for the third 10-year IST interval for North Anna Power Station, Units 1 and 2. Relief request P-5, submitted in your June 4, 2001, letter was withdrawn as requested in your October 25, 2001, submittal. In addition, relief requests P-6, P-7, and P-8, which were submitted in your June 4, 2001, letter were renumbered P-5, P-6, and P-7 as requested in your October 25, 2001 submittal.

The staff has reviewed and approved relief requests G-1, P-1 through P-7, and V-1 through V-3. On December 19, 2001, the staff provided verbal approval to VEPCO for relief requests P-5 and P-7, effective from the start of the third 10-year interval commencing on December 15, 2001. Our evaluation and conclusion of each relief is contained in the enclosed Safety Evaluation.

The staff has completed its evaluation of this matter; therefore, we are closing TAC Nos. MB2221 and MB2222.

Sincerely,

/RA/

Richard J. Laufer, Acting Chief, Section 1
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-338 and 50-339

Enclosure: As stated

cc w/encl: See next page

Mr. David A. Christian
Senior Vice President
and Chief Nuclear Officer
Virginia Electric and Power Company
Innsbrook Technical Center
5000 Dominion Blvd.
Glen Allen, Virginia 23060-6711

January 28, 2002

SUBJECT: NORTH ANNA POWER STATION, UNITS 1 AND 2 RE: INSERVICE TESTING PROGRAM FOR PUMP AND VALVES, THIRD TEN YEAR INTERVAL UPDATE (TAC NOS. MB2221 AND MB2222)

Dear Mr. Christian:

The purpose of this letter is to disposition the 12 requests for reliefs you submitted for North Anna Power Station, Units 1 and 2, related to the inservice testing (IST) program third 10-year interval. Of the 12 requests, 11 have been granted, and one was withdrawn as requested in your submittal.

By letter dated June 4, 2001, as supplemented by letter dated October 25, 2001, Virginia Electric and Power Company (VEPCO) submitted 12 requests for relief from the American Society of Mechanical Engineers Code requirements for the third 10-year IST interval for North Anna Power Station, Units 1 and 2. Relief request P-5, submitted in your June 4, 2001, letter was withdrawn as requested in your October 25, 2001, submittal. In addition, relief requests P-6, P-7, and P-8, which were submitted in your June 4, 2001, letter were renumbered P-5, P-6, and P-7 as requested in your October 25, 2001 submittal.

The staff has reviewed and approved relief requests G-1, P-1 through P-7, and V-1 through V-3. On December 19, 2001, the staff provided verbal approval to VEPCO for relief requests P-5 and P-7, effective from the start of the third 10-year interval commencing on December 15, 2001. Our evaluation and conclusion of each relief is contained in the enclosed Safety Evaluation.

The staff has completed its evaluation of this matter; therefore, we are closing TAC Nos. MB2221 and MB2222.

Sincerely,
/RA/
Richard J. Laufer, Acting Chief, Section 1
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-338 and 50-339

Enclosure: As stated
cc w/encl: See next page
<u>Distribution</u>:

GSBedi	RidsNrrPMSMonarque (paper copy)	PDII-1 R/F	JColaccino
RidsNrrDlpmLpdii	RidsNrrLAEDunnington (paper copy)	GHill (2)	
RidsOgcRp	RidsAcrsAcnwMailCenter	PUBLIC	

RidsRgn2MailCenter TMarsh

ADAMS ACCESSION NUMBER ML020280439 *No major changes made to the SE

OFFICE	PM:PDII/S1	LA:PDII/S2	DE:EMEB*	OGC	SC/PDII/S1
NAME	SMonarque	CHawes for EDunnington	DTerao		RLaufer
DATE	01/14/02	01/14/02	01/07/02	01/25/02	01/28/02

OFFICIAL RECORD COPY

Mr. David A. Christian
Virginia Electric and Power Company

North Anna Power Station
Unit 2

cc:

Mr. C. Lee Lintecum
County Administrator
Louisa County
P.O. Box 160
Louisa, Virginia 23093

Mr. Donald P. Irwin, Esquire
Hunton and Williams
Riverfront Plaza, East Tower
951 E. Byrd Street
Richmond, Virginia 23219

Dr. W. T. Lough
Virginia State Corporation
Commission
Division of Energy Regulation
P.O. Box 1197
Richmond, Virginia 23209

Old Dominion Electric Cooperative
4201 Dominion Blvd.
Glen Allen, Virginia 23060

Mr. Stephen P. Sarver, Director
Nuclear Licensing & Operations Support
Virginia Electric and Power Company
Innsbrook Technical Center
5000 Dominion Blvd.
Glen Allen, Virginia 23060-6711

Office of the Attorney General
Commonwealth of Virginia
900 East Main Street
Richmond, Virginia 23219

Senior Resident Inspector
North Anna Power Station
U.S. Nuclear Regulatory Commission
1024 Haley Drive
Mineral, Virginia 23117

Mr. David A. Heacock
Site Vice President
North Anna Power Station
P.O. Box 402
Mineral, Virginia 23117-0402

Mr. Richard H. Blount, II
Site Vice President
Surry Power Station
Virginia Electric and Power Company
5570 Hog Island Road
Surry, Virginia 23883-0315

Robert B. Strobe, M.D., M.P.H.
State Health Commissioner
Office of the Commissioner
Virginia Department of Health
P. O. Box 2448
Richmond, Virginia 23218

Mr. William R. Matthews
Vice President - Nuclear Operations
Virginia Electric and Power Company
Innsbrook Technical Center
5000 Dominion Boulevard
Glen Allen, Virginia 23060-6711

Summary of Relief Requests
North Anna Units 1 and 2 Third 10-Year Interval IST Program

Relief Request No.	10 CFR 50.55a: - ASME OM Code ISTA/ISTB/ISTC Section ASME Section XI	Issue Identified	Recommended NRC Action	Remarks
G1	ISTA 1.5 and ISTA 2.1 Section XI, IWA-2110	Eliminate involvement of the Authorized Nuclear Inservice Inspector (ANII)	(a)(3)(i)	authorized
P1	ISTB 4.3 (vibration only)	Smooth-running pumps	(a)(3)(i)	authorized
P2	Table ISTB 5.1-1 and ISTB 5.2.1(b)	Pump testing every cold shutdown instead of every 3 months. Code Case OMN-9, as an alternative to Comprehensive pump test (CPT)	(f)(6)(i) (a)(3)(i)	granted authorized
P3	ISTB 5.2.1(b)	Code Case OMN-9 instead of CPT	(a)(3)(i)	authorized
P4	ISTB 5.2.1(b)	Code Case OMN-9 instead of CPT	(a)(3)(i)	authorized
P5	Table ISTB 4.1-1 and Table ISTB 5.1-1	Use of recirculation loops per GL 89-04, every reactor refueling instead of every 3 months.	(a)(3)(ii)	authorized
P6	ISTB 4.1(a) and 4.3(e) Group A Comprehensive pump test	Use of 1 point instead of 5 points on curve. Reference value of flow 40% instead of 20% of design flow	(a)(3)(ii)	authorized
P7	Table ISTB 4.1-1 and ISTB 5.2.1(b)	Use of discharge pressure instead of differential pressure Use of Code Case OMN-9 instead of CPT	(a)(3)(i) (a)(3)(i)	authorized authorized
V1	ISTC 4.3.3(f)	Valve group leak rate test with additional documentation and record	(a)(3)(ii)	authorized
V2	ISTC 4.2.1 and 4.2.2	Manual valve test frequency	(a)(3)(i)	authorized
V3	ISTC 4.2.4(b), 4.2.8 and 4.2.9(b)	Use of Code Case OMN-8	(a)(3)(i)	authorized

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO THE THIRD 10-YEAR INTERVAL INSERVICE TESTING PROGRAM

VIRGINIA ELECTRIC AND POWER COMPANY

NORTH ANNA POWER STATION, UNITS 1 AND 2

DOCKET NUMBERS 50-338 AND 50-339

1.0 INTRODUCTION

Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a, requires that inservice testing (IST) of certain American Society of Mechanical Engineers (ASME) Code Class 1, 2, and 3 pumps and valves be performed at 120-month IST program intervals in accordance with a specified ASME Code and applicable addenda, except where alternatives have been authorized or relief has been requested by the licensee and granted by the Nuclear Regulatory Commission (NRC) 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 subsequent 120-month IST program intervals. Licensees whose IST program reaches its 120-month interval after November 22, 2000, are required to implement the 1995 Edition with the 1996 Addenda of the ASME *Code for Operation and Maintenance of Nuclear Power Plants* (ASME OM Code). In proposing alternatives or requesting relief, the licensee must demonstrate that (1) the proposed alternatives provide an acceptable level of quality and safety, (2) compliance would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety, or (3) conformance is impractical for the facility. Section 50.55a authorizes the NRC to approve alternatives to and grant relief from ASME Code requirements upon making the necessary findings. NRC guidance in Generic Letter (GL) 89-04, "Guidance on Developing Acceptable Inservice Testing Program," provides acceptable alternatives to the Code requirements. Further guidance is given in GL 89-04, Supplement 1, and NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants."

By letter dated June 4, 2001, Virginia Electric and Power Company (the licensee) submitted the third 10-year IST program plan for pumps and valves at North Anna Power Station Units 1 and 2. This submittal included a number of relief requests. The staff reviewed the relief requests and in a September 20, 2001, telephone conference call with the licensee, requested additional information to complete the review of the IST program. The licensee responded by submitting revised relief requests in its letter dated October 25, 2001.

The third 10-year IST interval for North Anna Power Station was delayed by 1 year as allowed by the Code and started on December 15, 2001, as the licensee informed the NRC in a letter dated February 23, 2000. The licensee stated that the third-interval IST program for North Anna Power Station was delayed pursuant to paragraph IWA-2430(d) of ASME Section XI. The IST program was developed in accordance with the requirements of the 1995 Edition, including the 1996 Addenda, of the ASME OM Code.

2.0 GENERAL RELIEF REQUEST

2.1 Relief Request G-1

The licensee requested relief from the requirements of ISTA 1.5 and 2.1 and the requirements of the ASME *Boiler and Pressure Vessel Code*, Section XI, Subsection IWA-2110, for pumps and valves. The licensee proposed to eliminate the involvement of the Authorized Nuclear Inservice Inspector (ANII) in the development and implementation of the IST program.

2.1.1 Licensee's Basis for Request

The ASME OMb Code-1997 Addenda to the 1995 ASME OM Code, ISTA 1.5 eliminates reference to access provisions for the Inspector. Requirements for access provisions for examination personnel and equipment remain. ISTA 2.1 from the 1995 ASME Code details the specific requirements for access for the Inspector, qualification of the Authorized Inspection Agencies, Inspectors and Supervisors and the duties of the Inspector. ISTA 2.1 has been deleted in its entirety from OMb Code-1997. Also, Section XI, IWA-2110, the 2000 Addenda to the 1998 Edition eliminates reference to inservice testing as duty of the inspector.

The Authorized Nuclear Inservice Inspector (ANII) review of the IST Programs is usually far less comprehensive than the review performed for the ASME Section XI inservice inspection activities. Normally the ANII just reviews the IST Program Plan and the records of tests performed. In general, ANIIs do not have the training or background experience to make determinations about component safety functions in order to verify program scope, or to assess the operational readiness of components based on test results.

North Anna has a multi-layered review process that performs the same functions as the ANII. Also, the IST Program is subject to the North Anna Quality Assurance Program. The quality assurance process at North Anna provides an equivalent, or greater level of quality and safety as the Code requirements for ANII involvement. Therefore, there is no quality-related benefit in duplicating the review efforts.

2.1.2 Licensee's Proposed Alternative

Requirements for access for the Inspector described in ISTA 1.5, requirements for access, duties of the ANII and qualification of the Authorized Inspection Agencies and Inspectors described in ISTA 2.1, and requirements for duties of the ANII described in Section XI, IWA-2110 will be eliminated from the IST Program.

Using the provision of this relief request as an alternative to the specific requirements of ISTA 1.5, ISTA 2.1, and Section XI, IWA-2110 identified above, will provide an

acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i) we request relief from the specific ISTB Code requirements identified in this relief request.

2.1.3 Evaluation

The 1995 Edition and the 1996 Addenda of the OM Code requires that the test activities be verified by an ANII. It is the ANII's duty to verify that the required inservice tests of pumps, valves, and component support, have been completed and the results recorded. ANSI/ASME N626.1 describes the ANII qualifications and duties applicable to Section XI. This part specifically addresses the duties to verify nondestructive tests, welding, heat treatment, and repairs and replacements but is silent on the responsibilities for IST. The licensee proposes to eliminate from the IST program provisions concerning site access for the ANIIs, the qualification of authorized inspection agencies and inspectors, and the duties of the ANII. The licensee states that the IST program is subject to the licensee's quality assurance program and that there is no quality-related benefit in duplicating the review efforts.

Generally, licensees have a multilayered review process that performs the same function as the ANII. ANIIs generally do not have the training or background experience to determine the safety functions of components (in order to verify the scope of the plan) or to assess the operational readiness of components based on test results. The requirement for ANII involvement in IST program has been removed from the 1997 OMb Code.

The licensee's own quality assurance process for the IST program provides an acceptable level of quality and safety. Therefore, the staff finds that the proposed alternative to the Code requirements of ISTA 1.5 and ISTA 2.1 and Section XI, IWA-2110 is acceptable.

2.1.4 Conclusion

Based on a review of the information provided by the licensee, the staff concludes that the licensee's proposed alternative to the Code ANII requirements of ISTA 1.5 and ISTA 2.1, and Section XI, IWA-2110, is authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the third 10-year interval, based on the alternative providing an acceptable level of quality and safety.

3.0 PUMP RELIEF REQUESTS

3.1 Relief Request P-1

The licensee has requested relief for the pumps listed in Table P-1 from the Code requirements of paragraph ISTB 4.3. ISTB 4.3 requires that the reference values be determined from the results of preservice testing or from the results of the first inservice test, of the IST program pumps. This request applies only to vibration testing.

Table-P-1

Pump Numbers Unit-1	Unit-2	OM Group	Function
1-CC-P-1A 1-CC-P-1B	2-CC-P-1A 2-CC-P-1B	A	Component Cooling Water Pumps
1-CH-P-2A 1-CH-P-2B	1-CH-P-2C 1-CH-P-2D	A	Boric Acid Transfer Pumps
1-EG-P-1HA 1-EG-P-1HB 1-EG-P-1JA 1-EG-P-1JB	2-EG-P-2HA 2-EG-P-2HB 2-EG-P-2JA 2-EG-P-2JB	B	Emergency Diesel Generator Fuel Oil Transfer Pumps
1-FW-P-3A 1-FW-P-3B		B	Motor Driven Auxiliary Feedwater Pumps
1-HV-P-20A 1-HV-P-20B 1-HV-P-20C	 2-HV-P-20B 2-HV-P-20C	A	Control and Relay Room Chilled Water Pumps
1-HV-P-22A 1-HV-P-22B 1-HV-P-22C	2-HV-P-22A 2-HV-P-22B 2-HV-P-22B	A	Control and Relay Room Condenser Water Pumps
	2-QS-P-1A 2-QS-P-1B	B	Quench Spray Pumps
1-RH-P-1A 1-RH-P-1B	2-RH-P-1A 2-RH-P-1B	A	Residual Heat Removal Pumps
1-RS-P-3A 1-RS-P-3B	2-RS-P-3A 2-RS-P-3B	B	Recirculation Spray Casing Cooling Pumps
1-SI-P-1A 1-SI-P-1B	 2-SI-P-1B	B	Low Head Safety Injection Pumps
1-SW-P-1B	2-SW-P-1B	A	Main Service Water Pumps
	2-SW-P-4	B	Auxiliary Service Water Pump

3.1.1 Licensee's Basis for Request

The pumps listed in Table P-1 have at least one vibration reference value (V_r) that is currently less than 0.05 inches per second (ips). Small values for V_r produce small acceptable ranges for pump operation. The acceptable range is defined in Table ISTB

5.2.1-1 as less than or equal to 2.5 V_r. Based on a small acceptable range, a smooth running pump could be subject to unnecessary corrective action.

For very small reference values, hydraulic noise and instrument error can be a significant portion of the reading and affect the repeatability of the subsequent measurements. Also experience gathered from the North Anna preventive maintenance program has shown that changes in vibration levels in range to 0.05 ips do not normally indicate significant degradation in pump performance.

To avoid unnecessary corrective action, a minimum value for V_r of 0.05 ips has been established for velocity measurements. This minimum value will be applied to individual vibration locations for the pumps listed in Table P-1 where the measured reference value is less than 0.05 ips.

When new reference values are established per paragraphs ISTB 4.4, 4.5, or 4.6, 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 grater than 0.05 ips, the requirements of ISTB 4.3 will be applied even if the pump is listed in Table P-1. Conversely, if the measured V_r is less than 0.05 ips, a minimum of 0.05 will be used for V_r even if the pump is not currently listed in Table P-1.

In addition to the requirements of ISTB, the pumps in the ASME Inservice Testing Program are included in the North Anna Predictive Maintenance Program. The North Anna Predictive Maintenance Program currently employs predictive monitoring techniques such as:

vibration monitoring and analysis beyond that required by ISTB,
bearing temperature trending,
oil sampling and analysis, and
thermography analysis.

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 are taken that may include:

increased monitoring to establish rate of change,
review of component specific information to identify cause, and
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 4.3 provides an acceptable level of quality and safety.

3.1.2 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 North Anna Predictive Maintenance Program regardless of their smooth running status.

Using the provisions of this relief request as an alternative to the specific requirements of ISTB 4.3 identified above will provide adequate indication of pump performance and continue to provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the licensee requests relief from the specified ISTB Code requirements identified in this relief request.

3.1.3 Evaluation

ASME OM Code, paragraph ISTB 4.7.4 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 5.2.1-1 of the ASME OM Code states that, if during an inservice test, a bearing vibration measurement exceeds 2.5 times the reference value (V_r), previously established as required by paragraph ISTB 4.3, the pump is considered in the alert range. The frequency of testing is then doubled in accordance with paragraph ISTB 6.2 until the condition is corrected and the vibration level returns below the alert range. Pumps whose vibration is recorded to be six times V_r, are considered in the required action range and must be declared inoperable until cause of the deviation has been determined and condition is corrected. The vibration reference values are required by paragraph ISTB 4.3 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 5.2.1-1, 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 the 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 ASME 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 assigned 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 pumps during testing. In addition, the Code committees have 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 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 listed in Table P-1 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, has a measured value below 0.05 ips. Therefore, the acceptable range as defined in Table ISTB 5.2.1-1 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 North Anna Predictive Maintenance Program goes beyond the IST requirements for pumps. The program includes bearing temperature trending, 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 degradation, 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 staff finds that the alert and required action limits specified in the relief request sufficiently address the previously undetected acute pump problems. The staff acknowledges 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 in lieu of the requirement specified in ISTB 4.3. 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 (Table 5.2.1-1), 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 the previous staff safety evaluation of similar issues. This relief request is not for relief from ISTB 4.3, but from the method of determining the reference value. Therefore, the licensee's proposed alternative will provide an acceptable level of quality and safety.

3.1.4 <u>Conclusion</u>

Based on a review of the information provided by the licensee, the staff concludes that the licensee's proposed alternative to the Code vibration requirements of ISTB 4.3 is authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the third 10-year interval, based on the alternative providing an acceptable level of quality and safety.

3.2 Relief Request P-2

The licensee has requested relief for residual heat removal pumps 1-RH-P-1A/1B and 2-RH-P-1A/1B from the OM Code requirements of Table ISTB 5.1-1 and paragraph ISTB 5.2.1(b). Table ISTB 5.1-1 requires that an inservice test be run on each Group A pump nominally every 3 months. ISTB 5.2.1(b) requires that "for centrifugal and vertical line shaft pumps, 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 values. 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."

3.2.1 Licensee's Basis for Requesting Relief

3.2.1.1 Licensee's basis for relief from the requirement of Table ISTB 5.1-1

> The residual heat removal [RHR] pumps are located inside the containment and are inaccessible during normal operation. The pumps are low pressure (600 psig design pressure) pumps that take suction from and discharge to the reactor coolant system (RCS). Technical Specification paragraphs 4.7.9.1a and 4.7.9.2a require that the RHR subsystem be isolated from the RCS prior to the RCS exceeding 500 psig by closing and de-energizing both remote operated RHR suction isolation valves and locking the associated breakers. Therefore, testing the residual heat removal pumps during normal operation is not practical and would violate the Technical Specifications.

3.2.1.2 Licensee's basis for relief from the requirements of Paragraph ISTB 5.2.1(b)

> As a result of industry experience and NRC guidance (Generic Letter 88-17) concerning the loss of decay heat removal capability, North Anna Power Station practices a policy of minimizing perturbations to RHR pump flow and system configuration when decay heat must be removed during cold shutdowns and reactor refueling outages.
>
> Therefore, to minimize system perturbations and to permit RHR pump testing during cold shutdown testing, the RHR pumps will be tested in a range of flows, and the results will be compared to acceptance criteria based on a portion of the pump curve and the hydraulic acceptance criteria given in ISTB. The guidelines set forth in Code Case OMN-9, "Use of a Pump Curve for Testing" will be followed. This alternative to the requirement of ISTB 5.2.1(b) provides an acceptable level of quality and safety.

3.2.2 Licensee's Proposed Alternative Testing

> These pumps will be tested every cold shutdown but not more frequently than once every three months. Acceptance criteria will be based on a portion of the pump curve and not on discreet reference values.
> Using the provisions of this relief request as an alternative to the specific requirements of ISTB 5.1-1 and ISTB 5.2.1(b) identified above, which have been identified to be impractical, will provide adequate indication of pump performance. Therefore, pursuant to 10 CFR 50.55a(f)(6)(i), we request relief from the specific ISTB Code requirements identified in this relief request.

3.2.3 Evaluation

3.2.3.1 Evaluation of relief from Table ISTB 5.1-1

The OM Code, Table ISTB 5.1-1, requires that a Group A test be performed quarterly on each Group A pump. The residual heat removal (RHR) pumps are low-pressure (600 psig design pressure) pumps which take suction from the reactor coolant system, pass flow through the residual heat exchangers, and discharge back to the reactor coolant system (RCS). The staff notes that the Technical Specification paragraphs 4.7.9.1a and 4.7.9.2a require that the RHR subsystem be isolated from the RCS before the RCS exceeds 500 psig by closing and de-energizing both remotely operated RHR suction isolation valves and locking the associated breakers. The RHR pumps' sole suction source is the RCS. These RHR pumps are in a standby condition during power operation, and are not exposed to operational wear except when the RCS is at low pressure and the RHR system is operating. The RHR system is a low pressure system that would rupture if exposed to the normal operating RCS pressure of approximately 2235 psig. Also, the RHR motor-operated suction valves are interlocked with RCS pressure and cannot be opened when the RCS is at normal operating pressure. These pumps are inside containment and thus are inaccessible during power operation. Testing of the RHR pumps during normal operation is not practical and would violate Technical Specifications. Therefore, compliance with the Code test frequency requirement (quarterly) is impractical. Major plant and system modifications would be needed to allow quarterly testing of the RHR pumps according to the Code requirements.

Based on the above information, the staff finds that compliance with the Code test frequency requirements is impractical and relief is granted pursuant to 10 CFR 50.55a(f)(6)(i).

3.2.3.2 Evaluation of relief from ISTB 5.2.1(b)

In addition to the alternative test frequency requirements of the Code, the licensee proposes an alternative to the testing method requirements of paragraph ISTB 5.2.1(b) during cold shutdown. As a result of industry experience and NRC Generic Letter 88-17 concerning the loss of decay heat removal capability, the licensee of the North Anna Power Station practices a policy of minimizing perturbations in the RHR pump flow and system configuration when decay heat must be removed during cold shutdowns and reactor refueling outages.

During cold shutdown, both trains of RHR may be needed for decay heat removal (DHR) and to maintain RCS temperature during short cold shutdowns or if the reactor coolant pumps (RCPs) are left running during the cold shutdown. Operating the RCPs during cold shutdowns adds a significant heat load to the RCS. Also, during short cold shutdowns, the decay heat load can be quite high. Taking one of the two trains of RHR out of service for testing according to the Code could allow the RCS temperature to increase and challenge the pressurizer power-operated relief valve (PORV). The pump flow measurement instrument is in the common line at the discharge of these pumps. Therefore, it is impractical to test the RHR pumps individually according to the Code test method requirements when both must be operated to meet cooling demands. These pumps are not in standby mode; rather, they run continuously during most cold shutdowns. Thus, to minimize system pertubations and permit RHR pump testing during cold shutdown, the RHR pumps will be tested in a range of flows, and the results will be compared to acceptance criteria based on a portion of the pump curve and on the hydraulic acceptance criteria given in Subsection ISTB and Code Case OMN-9. Therefore, the staff finds

that the proposed alternative provides reasonable assurance of operation readiness of pumps.

3.2.4 Conclusion

3.2.4.1 Conclusion on relief from Table ISTB 5.1-1

Based on a review of the information provided by licensee, the staff finds that compliance with the Code test frequency requirements of Table ISTB 5.1-1 for RHR pumps is impractical, and grants relief pursuant to 10 CFR 50.55a(f)(6)(i) for the third 10-year interval, provided the licensee tests these pumps according to the Code test method requirements during cold shutdown. The proposed testing provides reasonable assurance that the components are operationally ready. The granting of relief pursuant to 10 CFR 50.55a(f)(6)(i) is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

3.2.4.2 Conclusion on relief for ISTB 5.2.1(b)

Based on a review of the information provided by the licensee, the staff concludes that the licensee's proposed alternative to the Code reference value requirements of ISTB 5.2.1(b) for RHR pumps is authorized pursuant to 10 CFR 50.55a(a)(3)(i) third 10-year interval, based on the alternative providing an acceptable level of quality and safety.

3.3 Relief Request P-3

The licensee has requested relief for service water pumps 1-SW-P-1A/1B and 2-SW-P-1A/1B from the Code requirements of paragraph ISTB 5.2.1(b). ISTB 5.2.1(b) requires that "for centrifugal and vertical line shaft pumps, 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."

3.3.1 Licensee's Basis for Requesting Relief

> Plant conditions may not be the same as when the reference values were established. Many reference points must be established to anticipate future plant conditions. In the service water system, reproducing one of these reference flow points is not practical with the large butterfly valves installed and it may not be desirable to alter cooling because of other plant operating parameters. Therefore, pumps will be tested in a range of flows and the results will be compared to acceptance criteria based a portion of the pump curve and the hydraulic acceptance criteria given in ISTB. The guidelines set forth in Code Case OMN-9, "Use of a Pump Curve for Testing," will be followed.
>
> Past vibration data for the subject pumps has been reviewed and it has been determined that pump vibration does not vary significantly with flow rate over the range of the test flow rates. This alternative to the requirements of ISTB 5.2.1(b) provides an

acceptable level of quality and safety.

3.3.2 Licensee's Proposed Alternative Testing

Acceptance criteria will be based on a portion of the pump curve and not on discreet reference values. During September 20, 2001, telephone conference, the licensee said that Code Case OMN-9 guidelines will be used as an alternative.

3.3.3 Evaluation

The OM Code, paragraph ISTB 5.2.1(b), requires that "for centrifugal and vertical line shaft pumps, 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 is determined and compared to the reference flow rate value."

Based on a review of the information provided by the licensee, the staff finds that for service water pumps, it is not practical to return to the same flow configuration for each subsequent inservice pump test. In the service water system, temperature and flow are controlled at a variety of locations, it may not be possible to manually control each of the local stations and duplicate the overall system reference conditions, as required by the Code. The licensee will establish many reference points to anticipate future plant conditions. The pumps will be tested over a range of flows, and the results will be compared to the acceptance criteria based upon a portion of the pump curve and on the hydraulic acceptance criteria specified in Code Case OMN-9. The licensee will use the proposed criteria in Code Case OMN-9. The staff finds that the licensee's alternative test method and criteria in Code Case OMN-9 are technically adequate and provide reasonable assurance of the operational readiness of the pumps.

3.3.4 Conclusion

Based on a review of the information provided by the licensee, the staff concludes that the licensee's proposed alternative to the Code reference value requirements of paragraph ISTB 5.2.1(b) for safety-related pumps is authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the third 10-year interval, based on the alternative providing an acceptable level of quality and safety.

3.4 Relief Request P-4

The licensee has requested relief for component cooling pumps 1-CC-P-1A/1B and 2-CC-P-1A/1B from the Code requirements of paragraph ISTB 5.2.1(b). ISTB 5.2.1(b) states that "for centrifugal and vertical line shaft pumps, 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 is determined and compared to the reference flow rate value."

3.4.1 Licensee's Basis for Requesting Relief

Plant conditions may not be the same as when the reference values were established. Many reference points must be established to anticipate future plant conditions. In the

component cooling system, reproducing one of these reference flow points is difficult with the large butterfly valves installed and it may not be desirable to alter cooling because of other plant operating parameters. Therefore, pumps will be tested in a range of flows and the results will be compared to acceptance criteria based a portion of the pump curve and the hydraulic acceptance criteria given in ISTB. The guidelines set forth in Code Case OMN-9, "Use of a Pump Curve for Testing" will be followed.

Past vibration data for the subject pumps has been reviewed and it has been determined that pump vibration does not vary significantly with flow rate over range of the test flow rates. This alternative to the requirements of ISTB 5.2.1(b) provides an acceptable level of quality and safety.

3.4.2 Licensee's Proposed Alternative Testing

Acceptance criteria will be based on a portion of the pump curve and not on discreet reference values. During a September 20, 2001, telephone conference, the licensee said that the Code Case OMN-9 guidelines will be used as an alternative.

3.4.3 Evaluation

The OM Code, paragraph ISTB 5.2.1(b), requires that "for centrifugal and vertical line shaft pumps, 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 is determined and compared to the reference flow rate value."

Based on a review of the information provided by the licensee, the staff finds that for the component cooling water pumps, it is difficult to return to the same flow configuration for each subsequent inservice pump test. In the component cooling water system where temperature and flow are controlled at a variety of locations, it may not be possible to manually control each of these local stations and duplicate the overall system reference conditions, as required by the Code. The licensee established many reference points in anticipation of future plant conditions. The pumps will be tested in a range of flows, and the results will be compared to the acceptance criteria based on a portion of the pump curve and on the hydraulic acceptance criteria as specified in Code Case OMN-9. The licensee will use the proposed criteria in Code Case OMN-9. The staff finds that the licensee's alternative test method and acceptance criteria in Code Case OMN-9 are technically adequate and provide reasonable assurance of the operational readiness of the pumps.

3.4.4 Conclusion

Based on a review of the information provided by the licensee, the staff concludes that the licensee's proposed alternative to the Code reference value requirements of paragraph ISTB 5.2.1(b) for safety-related pumps is authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the third 10-year interval, based on the alternative providing an acceptable level of quality and safety.

3.5 Relief Request P-5

The licensee has requested relief for boric acid transfer pumps 1-CH-P-2A and 2B and 1-CH-P-2C and 2D from the Code requirements of Table ISTB 4.1-1 and Table ISTB 5.1-1. Table ISTB 4.1-1 requires that flow rate be measured during a Group A test. Table ISTB 5.1-1 requires that a Group A inservice test be run on each Group A pump nominally every 3 months.

3.5.1 Licensee's Basis for Request

Permanent flow instrumentation is not installed on the recirculation piping, which is the only test loop available for quarterly testing. To measure flow, flow must be established to the charging pump suction lines. This flow would increase the reactor coolant system (RCS) boron inventory and cause a reactivity transient during normal operation.

The pump test requires an extended period of boric acid injection which should only be performed when borating the reactor to cold shutdown conditions in preparation for refueling. There could be much less need for the volume of boric acid required to perform this test, if the test were to be conducted during a mid-cycle cold shutdown evolution, where the initial boron concentration in the RCS could be significantly higher. The potential for over boration under those conditions could delay the ability of the plant to restart, due to the time required to dilute the excess boron in preparation for startup. Therefore, testing the boric acid transfer pumps to the requirements of Table ISTB 4.1-1 and Table ISTB 5.1-1 is not considered practical.

3.5.2 Licensee's Proposed Alternative Testing

These pumps will be tested every quarter on the recirculation loops, and differential pressure and vibration will be measured. Every reactor refueling, a comprehensive test measuring differential pressure, flow and vibration will be performed. This alternate testing of the boric acid transfer pumps complies with NRC Generic Letter 89-04, Position 9.

Using the provision of this relief request as an alternative to the specific requirement of Table ISTB 4.1-1 and Table 5.1-1 identified above, which have been identified to be impractical, will provide adequate indication of pump performance. Therefore, pursuant to 10 CFR 50.5a(f)(6)(i), the licensee requests relief from the specific ISTB Code requirements identified in this request.

3.5.3 Evaluation

The OM Code, Table ISTB 4.1-1, requires that flow rate be measured during a Group A test and Table ISTB 5.1-1 requires that a Group A inservice test to be run on each Group A pump nominally every 3 months.

The boric acid transfer pumps supply boric acid to the suction of the charging pumps for emergency boration. During normal operation the pumps circulate the contents to the boron injection tank. As stated in the Updated Final Safety Analysis Report (UFSAR) (Reference 3), boric acid is stored in three boric acid storage tanks (shared by both Units 1 and 2). There are four boric acid transfer pumps. Pumps 1-CH-P-2A and 2B are for Unit 1 and 1-CH-P-2C and 2D are for Unit 2. One pump per unit is normally aligned with one boric storage tank. Each aligned pump runs continuously at low speed to provide recirculation between the boric acid storage tank and the boron injection tank of the emergency core cooling system. The second pump in each unit is normally used for boric acid batching and transfer and serves as a standby for the normal running pump. Manual or automatic initiation of the reactor makeup control system activates the continuously running pump to a higher speed to provide the makeup of boric acid solution as required.

The pump test requires an extended period of boric acid injection and should only be performed when borating the reactor to cold shutdown conditions in preparation for refueling. Conducting the test during a midcycle cold-shutdown evaluation, when the initial boron concentration in the RCS can be significantly higher, may delay the plant restart until the excess boron is diluted.

As such, only the recirculation flow path can be used to perform the quarterly pump tests. However, flow rate cannot be measured because there is no flow instrumentation in the recirculation loop. Compliance with the Code requirements would require system modifications and installation of online flow instrumentation, and would therefore cause a hardship for the licensee. In lieu of the Code-required test, the licensee proposes to test these pumps every quarter on the recirculation loops and measure the differential pressure and vibration. In addition, at every reactor refueling, the licensee will perform a comprehensive test to measure differential pressure, flow, and vibration. This alternative testing of the boric acid transfer pumps is consistent with NRC GL 89-04, Position 9, and is, thus acceptable.

On the basis discussed above, the staff concludes that the licensee's proposed alternative to the requirements of Table ISTB 4.1-1 and Table ISTB 5.1-1 is authorized pursuant to 10 CFR 50.55a(a)(3)(ii) on the basis that compliance with Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The staff finds that the alternative described above provides reasonable assurance of operational readiness of the boric acid transfer pumps.

3.5.4 Conclusion

Based on a review of the information provided by the licensee, the staff concludes that the licensee's proposed alternatives to the Code requirements of ISTB 4.1-1 and Table 5.1-1 for the boric acid transfer pumps are authorized pursuant to 10 CFR 50.55a(a)(3)(ii) for the third 10-year interval, on the basis that compliance with the specified requirements results in hardship without a compensating increase in the level of quality and safety.

3.6 Relief Request P-6

The licensee has requested relief for pumps 1-RS-P-2A and 2B and 2-RS-P-2A and 2B from the Code requirements of paragraphs ISTB 4.1(a) and ISTB 4.3(e). ISTB 4.1(a) (Preservice Testing) requires that "for centrifugal and vertical line shaft pumps 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." ISTB 4.3(e)(1) (Reference Values) requires that reference values shall be established within 20 percent of the pump design flow rate for comprehensive tests.

3.6.1 Licensee's Basis for Requesting Relief

3.6.1.1 Licensee's basis for relief from the requirements of Paragraph ISTB 4.1(a)

The test loop for the outside recirculation pumps consists of a 10" pump discharge line feeding into a 4" recirculation line which feeds back to the pump sump. Refer to Figure P-6.1. With test loop, pump design flow cannot be established. Also, the discharge piping was not designed to be temporarily reconfigured so that pump design flow could be achieved.

The outside recirculation spray pumps for Unit 2 were subject to long term full flow testing in 1979, during construction phase. A test loop was established by replacing the spray nozzles from each of the two spray headers (150 nozzles for each header) with plugs, discharging pump flow to the spray headers and directing the flow back to the containment sump. A dike was constructed around the containment sump to simulate water levels in containment that are expected during an accident. The outside recirculation spray pumps took suction from the sump, thus, completing the loop. Re-establishing this full flow test loop for the purpose of periodic testing would require plant modifications and is not practicable.

The spray headers are inaccessible without a significant amount of scaffolding. Even if the nozzles were accessible, the plugging of 300 spray nozzles, running the full flow test and returning the system to its operable configuration present substantial challenges in terms of complexity of the temporary modifications, labor intensive nature of the modifications, and controls and post modification testing needed to ensure that the system is returned to the original configuration.

As an alternative to flow testing at the design flow rate, the test loop shown in Figure P-6.1 will be used. Reference flows are typically established with test loop in the range of 1450 to 1500 gpm, whereas the pump deign flow is 3640 gpm. The low reference flows result from restrictions due to the small 4" recirculation line and the limited volume of water in the test loop. The limited water volume results in a rapid temperature rise in the test loop due to heat loads added by the running pump. This temperature rise affects repeatability of the measured hydraulic parameters. Therefore, care must be taken to ensure that the pump run time is limited and that the flow rate is maintained within an optimal range.

With the restrictions described above, the highest flow that can be measured while

maintaining stable test conditions is approximately 40% of design flow. Measuring more than one point on the pump curve is limited to flow rates less than 1450 to 1500 gpm range. Throttling the flow down to 20% of design flow to measure another point on the pump curve may cause flashing across the throttle valve which would cause hydraulic instabilities and questionable test results. Even if the measurements were valid, measuring one more point at 20% of design flow adds little to the determination of acceptable pump operation.

In the 1450 to 1500 gpm range of the head curve for these pumps, the head curve is not flat, but well sloped. Refer to Figure P-6.2. Therefore, as performance degrades due to internal recirculation caused by increasing internal pump clearances, the differential pressure will measurably decrease for a given reference flow rate. As discussed above, testing the outside recirculation spray pumps over the full range of the pump curve and measuring at least five points along the curve is impractical.

As an alternative to measuring at least five points for the preservice test, one point will be measured at approximately 40% of design flow. The proposed alternative to ISTB 4.1(a) provides an acceptable level of quality and safety.

3.6.1.2 Licensee's basis for relief from the requirements of paragraph ISTB 4.3(e)(1)

The pump design flow rate is 3640 gpm and the safety analysis flow is 3450 gpm. To be within 20% of the pump design flow requires a reference flow of 2912 gpm and to be within 20% of the safety analysis flow requires a reference flow of 2760 gpm. For the reasons stated above, reference flows are typically established in the range of 1450 to 1500 gpm, which is not within 20% of design flow.

As an alternative to testing within 20% of the design flow, the reference values will be established at approximately 40% of the design flow. It is our understanding that testing at design flow is important for pumps with characteristic head-flow curves that are flat or gently sloping in the low flow region (little change in developed head with increasing flow). In the low flow region, increasing internal flows, usually due to wear, are difficult if not possible to detect. Pumps with the "flat" curves at low flows should be tested at near design conditions to determine if increasing internal recirculation flows have degraded pump performance to the point where design requirements cannot be met. This situation does not apply to the outside recirculation pumps if they are tested at 40% of design flow. Testing at the reference flows will detect pump degradation because the pump curve is well sloped at the point of testing. Refer to Figure P-6.2. [for Units 1 and 2]

In addition to the testing described above, the outside recirculation pumps are included in the North Anna Predictive Maintenance Program. For the outside recirculation spray pumps, this program employs predictive monitoring techniques, such as vibration monitoring and analysis beyond that required by ISTB, and oil sampling and analysis.

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

monitor additional parameters,
review of component specific information to identify cause, and
removal of the pump from service to perform maintenance.

To ensure that the outside recirculation spray pumps can deliver the required accident flow, the acceptable operating range for differential pressure will be more restrictive then the range found in Table ISTB 5.2.3-1. The more restrictive range is based on a minimum allowable pump curve. This minimum allowable pump curve was generated to provide the minimum pump performance parameters that would support the outside recirculation system flow values used in the containment analysis of record. As discussed above, testing the outside recirculation spray pumps to within 20% of the design point is impractical.

The proposed alternative to ISTB 4.3(e)(1) provides an acceptable level of quality and safety.

3.6.2 Licensee's Proposed Alternative Testing

Preservice tests will be conducted using one point on the pump curve at approximately 40% of the pump design flow. Comprehensive test reference flow will be established at approximately 40% of the pump flow.

The outside recirculation spray pumps will be subject to additional testing, trending and diagnostic analysis of the North Anna Predictive Maintenance Program. Also, the acceptable operating range for differential pressure will be more restrictive than the range found in Table ISTB 5.2.3-1 to ensure that the outside recirculation spray pumps can deliver the required accident flow.

Using the provisions of this relief request as an alternative to the specific requirements of ISTB 4.1(a) and ISTB 4.3(e)(1) identified above, which have been identified to be impractical, will provide adequate indication of pump performance. Therefore, pursuant to 10 CFR 50.55a (f)(6)(i), we request relief from the specific ISTB Code requirements identified in this relief request.

RELIEF REQUEST P-6 (Cont.)

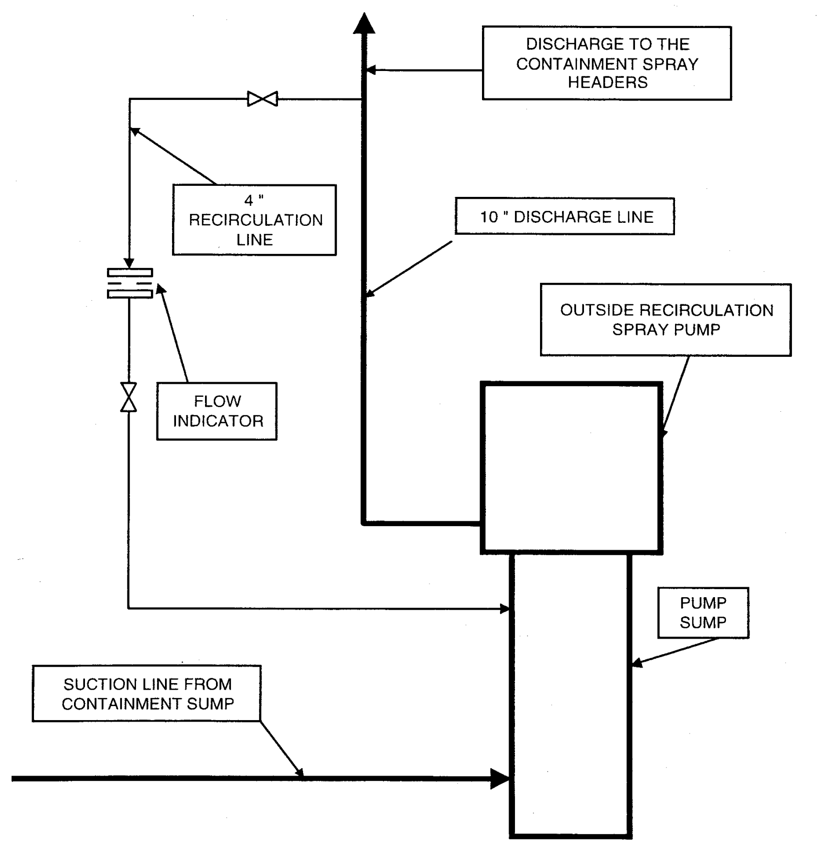


FIGURE P-6.1

Fig

ure No. P-6.1

Serial No. 01-327A
Unit 1
Relief Request P-6

RELIEF REQUEST P-6 (Cont.)

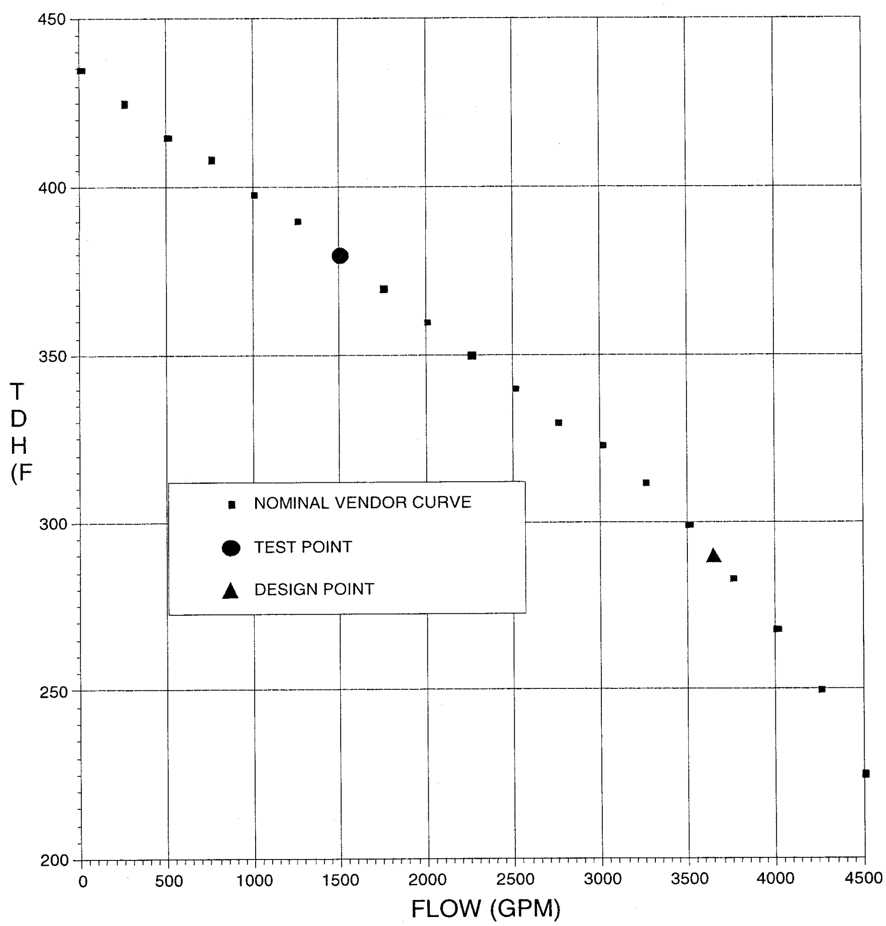


FIGURE P-6.2 (UNIT-1)

Fi

gure No. P-6.2 (UNIT-1)

Serial No. 01-327A
Unit 2
Relief Request P-6

RELIEF REQUEST P-6 (Cont.)

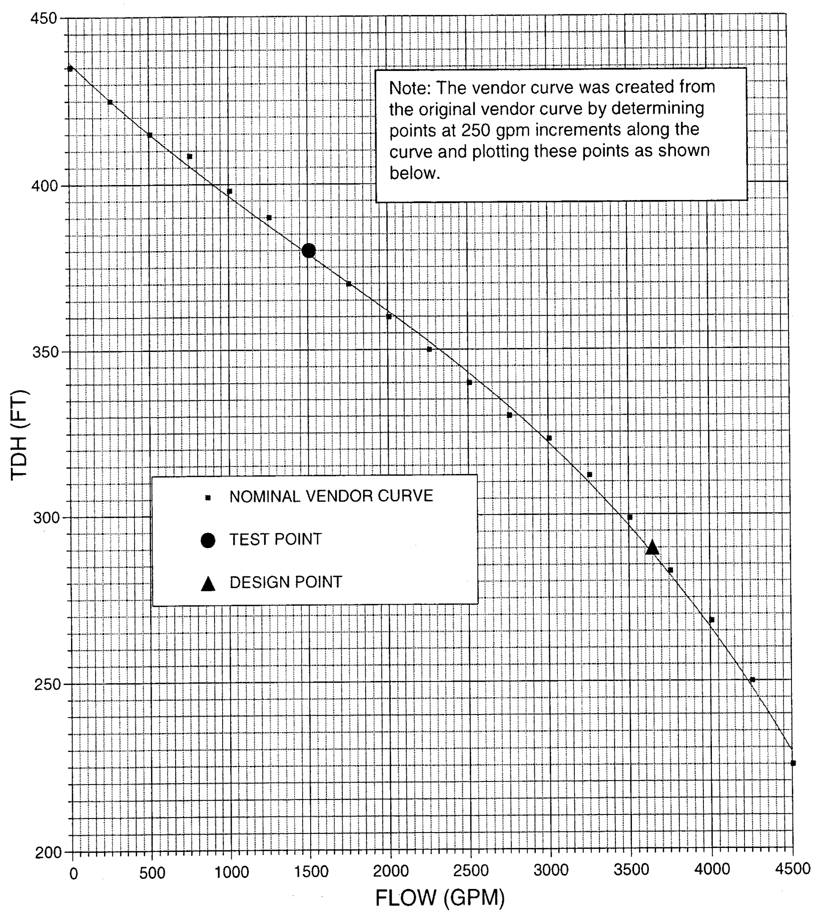
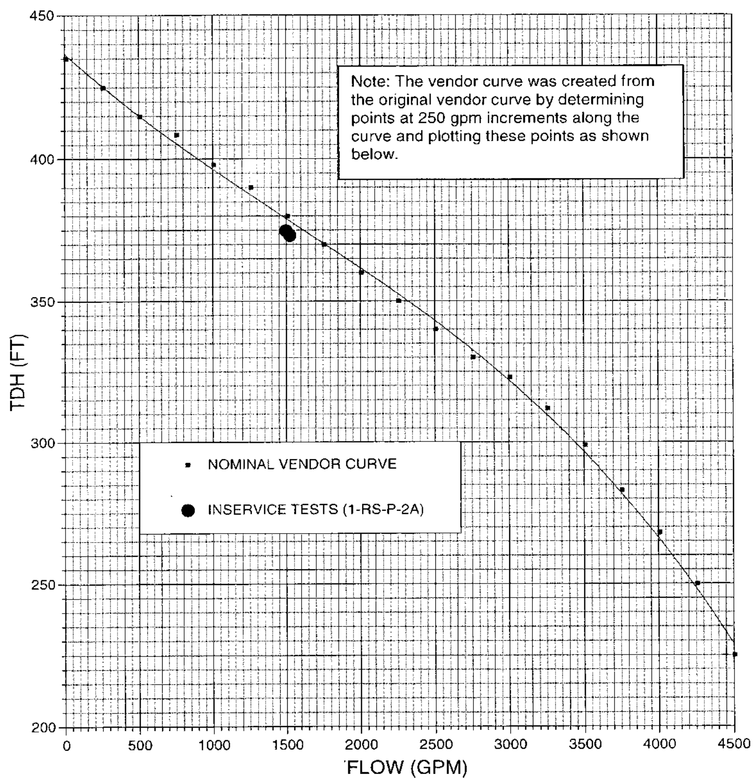


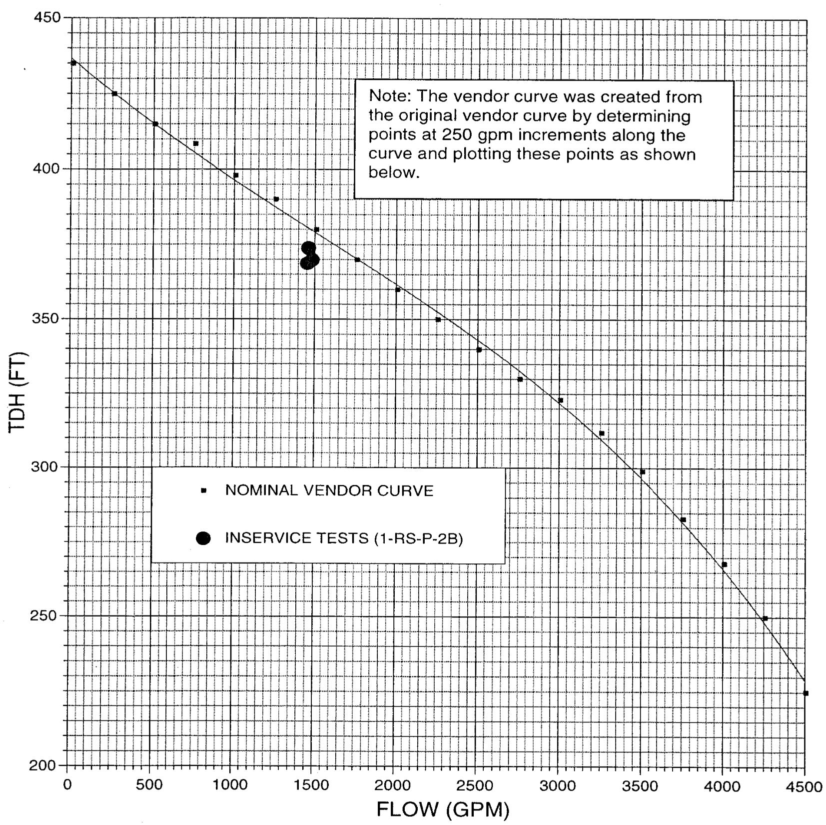
FIGURE P-6.2 (UNIT-2)

Figure No. P-6.2 (UNIT-2)



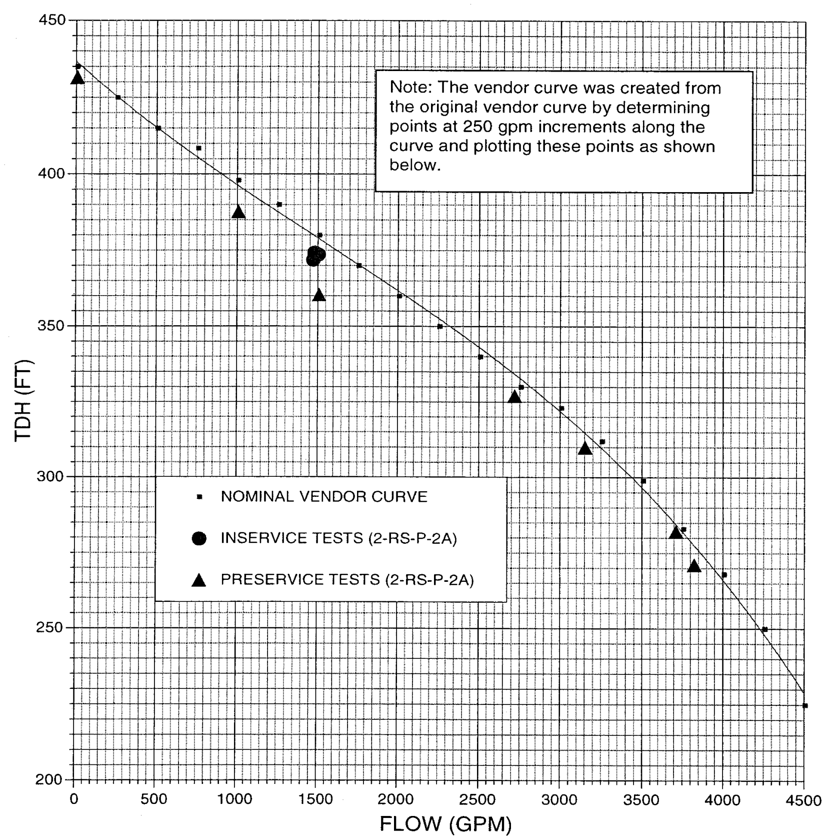
OUTSIDE RECIRCULATION SPRAY PUMP 1-RS-P-2A

Figure No. P-6.3

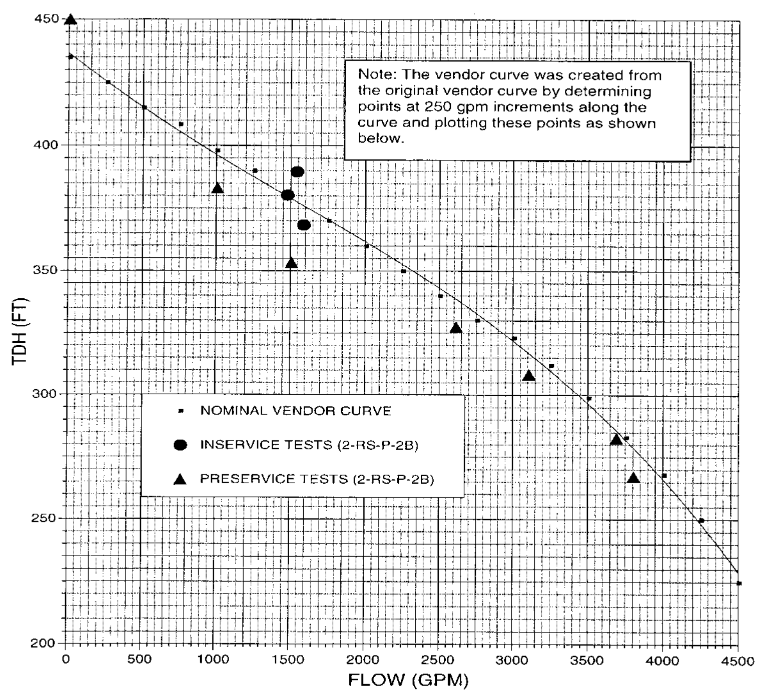


OUTSIDE RECIRCULATION SPRAY PUMP 1-RS-P-2B

Figure No. P-6.4



OUTSIDE RECIRCULATION SPRAY PUMP 2-RS-P-2A



OUTSIDE RECIRCULATION SPRAY PUMP 2-RS-P-2B

Fig ure No.
P- 6.5

Figure No. P-6.6

3.6.3 Evaluation

3.6.3.1 Evaluation of relief from ISTB 4.1(a)

The OM Code, paragraph ISTB 4.1(a), specifies that, “for centrifugal and vertical line shaft pumps in system where resistance can be varied, flow rate and differential pressure shall be measured at a minimum of five points. If practical, these points shall be from pump minimum flow to at least pump design flow.”

The outside recirculation spray (ORS) pumps supply borated water spray to cool and depressurize the containment atmosphere following a containment depressurization actuation signal and maintain containment sub-atmospheric pressure following an accident. There are two outside recirculating pumps per unit. The test loop for the outside recirculation pumps consists of a 10-inch discharge line feeding into a 4-inch recirculation line, which feeds back to the pump sump (Figure P-6.1). Pump design flow cannot be established using this test loop because of the 4-inch line size. Also, the discharge piping was not designed to be temporarily reconfigured so that pump design flow can be achieved.

The licensee states that the spray headers are inaccessible without a significant amount of scaffolding. Even if the nozzles were accessible, plugging 300 spray nozzles (150 nozzles per spray header), running the full-flow test and returning the system to its original operable configuration would cause a hardship to the licensee without a compensating increase in quality and safety.

As an alternative to the flow testing at design flow rate, the licensee has proposed testing with a test loop shown in Figure P-6.1. The test loop is a 4-inch recirculation line. The reference flows established with this test loop are in the range of 1450 to 1500 gpm whereas the pump design flow is 3640 gpm. The low reference flows are limited due to size of 4-inch recirculation line. The limited water volume and the heat loads added by the running pump will rapidly raise the temperature of the water in the test loop. The testing will be performed in a manner to ensure that the pump run time is limited and the flow is maintained within an optimal range. The highest flow that can be measured while maintaining stable test conditions is approximately 40 percent of design flow. Measuring more than one point on the pump curve is limited to flow rates less than the 1450 to 1500 gpm range. Throttling the flow down to 20 percent of design flow to measure another point on the curve may cause flashing across the throttle valve producing hydraulic instabilities and less-than-meaningful results. In the 1450 to 1500 gpm range of the head curve for these pumps, the head curve is not flat but well sloped. (See Figure P-6.2 for Units 1 and 2). As shown in the Figure P-6.2, the test point falls on the nominal vendor curve. Any deviation from the nominal curve will show degradation of the pump.

The licensee provided pump curves for Units 1 and 2. Figures P-6.3 and P-6.4 are for Unit 1 outside recirculating spray pumps 1-RS-P-2A and 2B. The curves in these figures show nominal vendor curves with inservice test points. For Unit 2 pumps 2-RS-P-2A and B, the curves in Figures P-6.5 and P-6.6 show not only inservice test points but preservice test points. The reason is that the licensee performed preservice tests for Unit 2 pumps only due to hardship as explained by the licensee in the Section 3.6.2 above. The Unit 2 pump curves shows that the slopes of the nominal vendor curves and the preservice test are very close. The slopes of the Unit 1 pump pretest curves would presumably have resembled the slopes of the Unit 2 pump preservice tests, because the Units 1 and 2 pumps are similar. Therefore,

measuring one point at approximately 40 percent of the pump design flow as an alternative to measuring at least five points for the preservice test will provide more meaningful results to ensure operational readiness of the pump.

3.6.3.2 Evaluation of relief from ISTB 4.3(e)(1)

The outside recirculation spray pumps supply borated water spray to cool and depressurize the containment atmosphere following a containment depressurization actuation signal and maintain containment sub-atmospheric following an accident.

The Code requires in ISTB 4.2 that a comprehensive test be conducted in accordance with ISTB 5.2.3. The inservice test parameters that must be measured during the comprehensive test for the outside recirculation spray pumps, as specified in Table ISTB 4.1-1, are differential pressure, flow rate, and overall vibration. The OM Code, paragraph ISTB 4.3(e)(1), specifies that the reference values for the comprehensive test shall be established within ± 20 percent of the pump design flow rate. Table 5.1-1 specifies that the comprehensive test be conducted biennially for each pump in the IST program.

The outside recirculation spray pump design flow rate is 3640 gpm and safety analysis flow is 3450 gpm. For the reason stated above under Section 3.6.3.1, the reference flows are established in the range of 1450 to 1500 gpm, which is not within 20 percent of design flow. As an alternative to testing within 20 percent of the design flow, the licensee proposed to established the reference values at approximately 40 percent of the design flow. Testing at design flow is important for pumps with head-flow curves that are "flat" or gently sloping in the low region (pump whose developed head changes little with increasing flow). Pumps with the flat curves at low flows should be tested at near design conditions to determine if increasing internal recirculation flows have degraded pump performance to the point where pump degradation can be more readily assessed. This situation does not apply to outside recirculation pumps if they are tested at 40 percent of design flow because at 40 percent design flow (1450 to 1500 gpm) the head curve for these pumps is not flat but well sloped. (See Figure P-6.2). For these pumps the total developed head (TDH) changes significantly with increase in flow.

From Figure P-6.2, the nominal vendor curves, the shutoff head of pumps is 435 feet. As discussed above, the pump can only be tested on a recirculation flow path which is sized for approximately 40 percent (1500 gpm) of the design flow of 3640 gpm. In case of Seabrook Station, Unit 1 (Reference 5), the shutoff head is 700 ft. The pump can be tested on recirculation flow path which is sized for approximately 68 percent (1900 gpm) of the required design flow of 2808 gpm. The flow and TDH values from the head-flow curves for North Anna Station and Seabrook Station (Reference 5) are shown in the following table for comparisons:

	North Anna Station Pump			Seabrook Station Pump		
Flow (gpm)	0	1500	3640	0	1900	2808
Total Developed Head (feet)	435	380	290	700	685	560

Based on the above head-flow curves data, it is found that for North Anna Station pump head-flow curves are well sloped, whereas, the Seabrook Station pump head-flow curves are “flat” or gently sloping in the low region. Therefore, testing at reference flows for North Anna Station will detect pump degradation because pump curve is well sloped at the point of testing.

The licensee provided curves (Figure P-6.2) showing flow rate versus the corresponding TDH. The intent of the curve is to provide trend data on the TDH at each measured flow rate for the outside recirculation pumps. The expected result is that at higher flow rates, there is a lower pump TDH. This provides an indication that the pumps were tested in an area of the curve where the intent of the comprehensive test would be satisfied.

The licensee states that the outside recirculating pumps are also included in the North Anna Predictive Maintenance Program. This program employs predictive monitoring techniques that go beyond the vibration monitoring and analysis required by ISTB, and oil sampling and analysis. If the measured parameters are outside the normal operating range or are determined by analysis to be trending toward an unacceptable degraded state, the licensee will take appropriate actions including monitoring additional parameters, review of component specific information to identify cause, and removal of the pump from service to perform maintenance.

The licensee stated in its relief request that to perform the Unit 2 full-flow test during the construction phase, a test loop was established by replacing the spray nozzles of each of the two spray header (150 nozzles per header) with plug, discharging pump flow to the spray headers, and directing the flow back to the containment sump. A dike was constructed around the containment sump to simulate water levels in containment that are expected during accident. The ORS pumps took suction from the sump, thus completing the loop. Re-establishing this full-flow test loop for the purpose of periodic testing would be a hardship on the licensee.

Based on a review of the provided curves and information regarding the North Anna Predictive Maintenance Program, the staff finds that alternative provides reasonable assurance of the operational readiness and compliance with the specified requirement would result in a hardship without a compensating increase in the level of quality and safety.

3.6.4 Conclusion

Based on the review of the information provided by the licensee, the staff concludes that the licensee’s proposed alternative to the Code number of points on pump test curves and to reference value requirements of Table ISTB 4.1(a) and paragraph ISTB 4.3(e)) for the recirculation spray pumps 1-RS-P-2A and 2B, and 2-RS-P-2A and 2B is authorized pursuant to 10 CFR 50.55a(a)(3)(ii) for the third 10-year interval, on the basis that compliance with the specified requirement results in a hardship without a compensating increase in the level of quality and safety. The staff further concludes that the alternative provides reasonable assurance of the operational readiness of the pump.

The staff finds that the licensee has committed to include all the outside recirculating pumps in the North Anna Predictive Maintenance Program. Under this program, if the measured parameters are outside the normal operating range or are determined by the analysis to be

trending towards an unacceptable degraded state, the licensee will take appropriate actions including monitoring additional parameters, reviewing component specific information to identify cause, and removing the pump from service to perform maintenance.

3.7 Relief Request P-7

The licensee has requested relief for service water pumps 1-SW-P-4 and 2-SW-P-4 from the Code requirements of Table ISTB 4.1-1 and paragraph ISTB 5.2.1(b). Table ISTB 4.1-1 (Inservice Test Parameters) requires the measurement of differential pressure. ISTB 5.2.1(b) requires that "for centrifugal and vertical line shaft pumps, 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 values. Alternatively, the flow rate shall be varied until the differential pressure equals the reference point and the flow rate is determined and compared to the reference flow rate value."

3.7.1 Licensee's Basis for Request

3.7.1.1 Licensee's basis for relief from the requirement of Table ISTB 4.1-1:

> This pump takes suction from Lake Anna. No inlet pressure instrumentation is installed. The North Anna lake level indicator is located near North Anna dam, miles from the auxiliary service water pump intake. The indicator is outside and approximate 20 feet from the observation point. Therefore, measuring the lake level can be difficult during periods of inclement weather or low light conditions.
>
> However, the lake level fluctuates very little from the test to test and can be considered to be constant. The lake has a minimum level of 244 feet elevation as required by Technical Specifications, and maximum and minimum recorded levels during past testing of 250.24 feet and 248.16 feet, respectively. Therefore, the expected maximum variation in the lake level is about 2 feet, which is less than 1 psi. The discharge pressure gauge has a full scale reading of 100 psig and the discharge pressures range from 50 to 65 psig. Even the maximum variation, which in all likelihood will not occur between successive tests, is a small percentage of the total head developed by the pump. Therefore, the repeatability of the tests and the ability to detect degradation will not be significantly affected if only discharge pressure is measured.
>
> Applying the Code acceptance criteria to discharge pressure instead of differential pressure is a conservative application of the acceptance criteria for the deep draft pump because the operability band is smaller. For this pump, the total developed head is calculated by adding the measured discharge pressure to the height from the discharge pressure gauge to the pump impeller, subtracting the height from the lake surface to the pump impeller. Therefore, the measured discharge pressure will always be a smaller number than the actual total head developed by the pump. This alternative to the requirements of Table ISTB 4.1-1 provides an acceptable level of quality and safety.

3.7.1.2 Licensee's basis for relief from the requirements of paragraph ISTB 5.2.1(b)

> Plant conditions may not be the same as when the reference values were established. Many reference points must be established to anticipate future plant conditions. In the

service water system, reproducing one of these reference flow points is difficult with the large butterfly valves installed and it may not be desirable to alter cooling because of other plant operating parameters. Therefore, pumps will be tested in a range of flows and the results will be compared to acceptance criteria based a portion of the pump curve and the hydraulic acceptance criteria given in ISTB. The guidelines set forth in Code Case OMN-9, “Use of a Pump Curve for Testing” will be followed. This alternative to the requirements of ISTB 5.2.1(b) provides an acceptable level of quality and safety.

3.7.2 Assessment of Combining Requests for Relief

By letter dated October 18, 1994, the NRC requested licensee to assess the impact on operational readiness resulting from the combination of using a discharge pressure and a pump curve. The licensee responded to this request by letter dated October 18, 1995. As described in our letter, the assessment included a review of normalized test data for each pump. North Anna has the ability to normalize the test data and trend the data from test to test. By knowing the polynomial equation that describes the reference pump curve, a reference value was calculated for the dependent variable using the value of the independent variable. The actual test results is divided by the reference value to yield a normalized test result, which was then used to trend the performance of the pump. This review showed that the test results were trendable and provide the ability to assess the operational readiness of the pump.

3.7.3 Licensee’s Proposed Alternative Testing

Discharge pressure will be measure in place of differential pressure. Acceptance criteria will be based on a portion of the pump curve and not on discreet reference values.

Using the provision of this relief request as an alternative to the specific requirements of Table ISTB 4.1-1 and ISTB 5.2.1(b) identified above will provide adequate indication of pump performance and continue to provide acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), we request relief from the specific ISTB Code requirements as identified in this relief request.

3.7.4 Evaluation

3.7.4.1 Evaluation of relief from Table ISTB 4.1-1

The OM Code, Table ISTB 4.1-1, requires measurement or determination of pump differential pressure. The differential pressure may be determined by subtracting the pressure measured at a point in the inlet pipe from the pressure measured at a point in the discharge pipe. The service water pumps are not equipped to directly measure inlet or differential pressure. Inlet pressure can be determined by measuring the head of water above the suction. The licensee states that taking the level measurement is difficult due to residue on the level indicator, inadequate lighting conditions, and remoteness of the indicator from the pump.

The pump suction head depends on the North Anna Lake level, which fluctuates very little from test to test and can be considered constant. The maximum difference in inlet pressure available to the pump is less than 1 psig. The pump discharge pressure is 50 psig or greater. Therefore, the maximum impact of a change in inlet pressure on discharge pressure is less than 2 percent of the discharge pressure. This accuracy is consistent with the acceptable accuracy of ± 2 percent specified in NUREG-1482, Section 5.5.3. Therefore, the overall impact of inlet pressure on discharge pressure is negligible, and a change in inlet pressure should not significantly decrease the licensee's ability to assess the hydraulic condition and determine the operational readiness of these pumps.

The licensee proposes to measure discharge pressure and to apply ASME OM Code, Table ISTB 4.1-1, acceptance criteria, to discharge pressure in lieu of differential pressure. The licensee states that "the measured discharge pressure will always be smaller number than the actual total head developed by the pump" and that "applying the Code acceptance criteria to discharge pressure instead of differential pressure is a conservative application of the acceptance criteria for the deep draft pump." The proposed alternative to the Code requirements of Table ISTB 4.1-1 is acceptable because it is consistent with the guidelines of NUREG-1482, Section 5.5.3. The proposed alternative provides reasonable assurance of the operational readiness of the service water pumps and provides an acceptable level of quality and safety.

3.7.4.1 Evaluation of relief from Table ISTB 5.2.1(b)

The OM Code, paragraph ISTB 5.2.1(b), states that "for centrifugal and vertical line shaft pumps, 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 values. 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." Based on the information provided by the licensee, the staff finds that it is difficult to return to the same flow configuration for each subsequent inservice test for service water pumps. In the service water system temperature and flow are controlled at a variety of locations, and it may not be possible to manually control each of the local stations and duplicate the overall system reference conditions, as required by the Code. The licensee will establish many reference points to anticipate future plant conditions. The pumps will be tested in a range of flows, and the results will be compared to the acceptance criteria based a portion of the pump curve and on the hydraulic acceptance criteria specified in Code Case OMN-9. The licensee will use the proposed criteria in Code Case OMN-9. The staff finds that the licensee's alternative test method and acceptance criteria in Code Case OMN-9 are technically adequate and provide reasonable assurance of the operational readiness of the pumps.

3.7.5 Conclusion

3.7.5.1 Conclusion on relief request from Table 4.1.1

Based on a review of the information provided by the licensee, the staff concludes that the licensee's proposed alternative to use discharge pressure instead of differential pressure to meet the Code requirements of Table 4.1-1 for safety-related pumps is authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the third 10-year interval, based on the alternative providing an acceptable level of quality and safety.

3.7.5.2 Conclusion on relief request from ISTB 5.2.1(b)

Based on a review of the information provided by the licensee, the staff concludes that the licensee's proposed alternative to the Code reference value requirements of ISTB 5.2.1(b) for safety-related pumps is authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the third 10-year interval, based on the alternative providing an acceptable level of quality and safety.

4.0 VALVE RELIEF REQUESTS

4.1 Relief Request V-1

The licensee has requested relief for the valves listed in Table V-1 from the Code requirements of paragraph ISTC 4.3.3(f). ISTC 4.3.3(f) requires that valves or valve combinations with leakage rates exceeding the values specified by the owner in ISTC 4.3.3(e) be declared inoperable and be either repaired or replaced. A retest demonstrating acceptable operation shall be performed following any required corrective action before the valve is returned to service.

Table V-1

Valves		OM Category	System
Unit-1	Unit-2		
1-CH-MOV-1115B 1-CH-MOV-1115D	2-CH-MOV-2115B 2-CH-MOV-2115D	A	Chemical and Volume Control
1-SI-MOV-1885A 1-SI-MOV-1885B 1-SI-MOV-1885C 1-SI-MOV-1885D	2-SI-MOV-2885A 2-SI-MOV-2885B 2-SI-MOV-2885C 2-SI-MOV-2885D	A	Safety Injection
1-SI-47	2-SI-18	AC	Safety Injection

4.1.1 Licensee's Basis for Request

Valves 1-CH-MOV-1115B and D, [2-CH-MOV-2115B and D] and 1-SI-47 [and 2-SI-18] are in the supply line to the charging pumps from the [refueling water storage tank] RWST. Valves 1-SI-MOV-1885A, B, C and D, [and 2-SI-MOV2885A, B, C and D] are on test lines that run from the discharge of the low head SI pumps to the RWST. During recirculation mode transfer, the RWST is isolated and the low head SI pump recirculate highly contaminated water from the containment sump to the reactor vessel.

The RWST isolation valves work as a system of valves to protect the RWST from the contaminated sump water. Permissible valve leakage rates are based on each valve's

possible contribution to the total allowable leakage rate to the RWST. When the leakage from each valve have been measured and summed with the leakage rate of the other RWST isolation valves, an individual valve's permissible leakage rate may have been exceeded but the overall allowable leakage to the RWST may not have been exceeded. In these cases, a repair or replacement may not be necessary because the system of isolation valves has been verified to be performing acceptably.

In addition to repair or replacement as corrective actions, an evaluation can be performed which demonstrates that if a valve has exceeded its permissible leakage rate, the overall leakage rate to the RWST will be maintained below the overall allowable RWST leakage rate and hence the system function is satisfied.

This evaluation should provide a high level of assurance that delaying the repair or replacement will not result in exceeding the overall limit before the next leak rate test. The evaluation should include a determination of the cause for the individual valve leakage. The evaluation should also address the effect of the degradation mechanism for the valve on the ability of the valve group to maintain overall leakage to the RWST below the overall allowable leakage rate during the subsequent 24 month interval. Evaluation will be documented and retained in plant records, and are available for the subsequent review. This alternative to the requirements of ISTC 4.3.3(f) provides an acceptable level of quality and safety.

4.1.2 Licensee's Proposed Alternative Testing

In addition to repair or replacement as corrective actions, an evaluation can be performed which demonstrates that even if a valve has exceeded its permissible leakage rate, the overall leakage rate to the RWST will be maintained below the overall allowable RWST leakage rate. No repair or replacement is necessary if the evaluation is performed and system leakage is projected to be maintained below the overall permissible leakage rate throughout the subsequent 24 month interval.

Using the provision of this relief request as an alternative to the specific requirements of ISTC 4.3.3(f) identified above [under section 4.1.1] will provide adequate indication of valve performance and continue to provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i) we request relief from the specific IST[C] Code requirements identified in relief request.

4.1.3 Evaluation

The OM Code, paragraph ISTC 4.3.3 (Leakage Rate for Other than Containment Isolation Valves) requires that Category A valves, which perform a function other than containment isolation, shall be seat leakage tested at least once every 2 years to verify their leak-tight integrity. This test is intended to verify the operational readiness of individual components. Failure of a valve to meet an acceptance criteria indicates that the valve is potentially degraded and may be incapable of performing its safety function. However, the leakage rate limits assigned to individual RWST isolation valves are artificially derived values because the critical leakage limit for these valves is the limit for overall leakage to the RWST. If one valve exceeds

its leakage rate limit, the valve has not seated tightly and may be degraded. However, exceeding an individual rate limit does not indicate that the group of all RWST isolation valves cannot meet their leak-tight safety function unless the leakage limit to the RWST is exceeded. Applying the analysis of leakage rates and corrective action requirement of paragraphs ISTC 4.3.3(e) and ISTC 4.3.3(f) in this situation may not be appropriate because the group of valves can meet their leak tight-safety function. Requiring the licensee to delay plant startup or to shut down the plant to repair or replace one of the RWST isolation valve that exceeds its individual limit would cause a hardship and would not provide a compensating increase in the level of quality and safety as long as the overall leakage rate is less than the specified limit of leakage to the RWST throughout the subsequent 2-year interval.

If a valve has significant leakage for its size (beyond the leakage associated with seat damage or slight misalignment), the leakage could indicate other significant valve degradation problems that could result in the valve's failure to go to its safety position. In this case, continued plant operation before valve repair or replacement may not be appropriate. This is especially true for smaller valves which may have significant leakage for their size without causing the total leakage rate to approach the overall limit. When a valve's leakage rate is so high that its closure capability is questionable, the concern is not only exceeding the leak rate testing requirements of ISTC 4.3, but not meeting the valve-exercising requirements of paragraph ISTC 4.2.

The licensee did not provide details about the evaluation that it would perform to demonstrate that "even if a valve has exceeded its permissible leakage rate, the overall leakage rate to the RWST will be maintained below the overall allowable RWST leakage rate." But the licensee stated that in order to make this determination, it may be necessary to ascertain the root cause of the increased leakage rate and establish the rate at which this degradation could progress. The licensee states that the evaluation will be documented and retained in plant records and available for the subsequent review. Therefore, this evaluation is an important aspect of this relief request and should be performed in a manner that provides a high level of assurance that delaying the repair or replacement of individual valves with high leakage rates will not result in exceeding the overall limit before the next 2-year leakage rate test.

Based on the above information, the staff finds that requiring the licensee to delay plant startup or to shut down the plant to repair or replace an RWST isolation valve that exceeds its individual leakage limit would cause hardship and would not provide a compensating increase in the level of quality and safety as long as the individual leakage rate does not indicate the probability of severe valve degradation and the overall leakage rate is less than the established limit. This alternative does not apply to valves that perform a limited leakage function in addition to or other than limiting leakage to the RWST (e.g., pressure isolation), because the basis for the leakage limits for these valves is different than for the overall leakage-to-the-RWST limit discussed above.

4.1.4 Conclusion

Based on a review of the information provided by the licensee, the staff concludes that the licensee's proposed alternative to the Code valve leak requirement, as specified in ISTC 4.3.3(f) is authorized pursuant to 10 CFR 50.55a(a)(3)(ii) for the third 10-year interval, on the basis that compliance with Code requirement will cause hardship or unusual difficulty without compensating increase in the level of quality and safety. This alternative does not apply to

valves that perform a limited leakage function in addition to or other than limiting leakage to the RWST (e.g., pressure isolation), because the basis for the leakage limits for these valves is different than for the overall leakage-to-the-RWST limit discussed above.

4.2 Relief Request V-2

The licensee has requested relief for the manual valves listed in Table V-2 from the test requirements of the OM Code, paragraphs ISTC 4.2.1 and ISTC 4.2.2. ISTC 4.2.1 requires that valves be tested nominally every 3 months except as provided by paragraphs ISTC 4.2.2, ISTC 4.2.5 and ISTC 4.2.7. ISTC 4.2.2 requires full-stroke exercising during plant operation or, if not practicable during plant operation then during or, if not practicable during cold shutdown then during reactor refueling.

Table V-2

Valves		OM Category	Function
Unit-1	Unit-2		
1-CH-241	2-CH-156	B	Alternate Emergency Boration Line Manual Valves
1-FW-062 1-FW-064 1-FW-094 1-FW-096 1-FW-126 1-FW-128 1-FW-149 1-FW-155 1-FW-166 1-FW-172 1-FW-184 1-FW-190	2-FW-064 2-FW-066 2-FW-096 2-FW-098 2-FW-128 2-FW-130 2-FW-157 2-FW-173 2-FW-174 2-FW-193 2-FW-194 2-FW-317	B	Auxiliary Feedwater Header Alignment and Cross Connect Manual Isolation Valves
1-FW-145 1-FW-162 1-FW-180 1-FW-227	2-FW-147 2-FW-164 2-FW-182 2-FW-202	B	Auxiliary Feedwater Pump Alternate Supply Manual Isolation Valves
1-MS-018 1-MS-057 1-MS-095	2-MS-018 2-MS-057 2-MS-095	B	Main Steam to Auxiliary Feedwater Turbine Line Manual Isolation Valves
1-SW-1067 1-SW-1070 1-SW-1139		B	Service Water Chemical Addition System Manual Isolation Valves

4.2.1 Licensee's Basis for Request

The manual valves listed in Table V-2 remain in their aligned positions during normal operation and are not subject to significant process fluid wear. Also, the valves have a simple design with limited number of failures causes. Therefore, an extended testing interval beyond the 3 month testing interval required by ASME OMa Code-1996 is acceptable for testing these manual valves.

Paragraph ISTC-3540 in the ASME Code, 1999 Addenda states,

"Manual valves shall be full-stroke exercised at least once every 5 years, except where adverse conditions[1] may require the valve to be tested more frequently to ensure operational readiness. Any increase testing frequency shall be specified by the owner. The valve shall exhibit the required change of obturator position."

Note 1 states

"Harsh service environment, lubricant hardening, corrosive or sediment laden process fluid, or degraded valve components are some examples of adverse conditions."

However, in Proposed Rules issued for comments in the *Federal Register*, Vol. 66, No. 150, dated August 3, 2001, the NRC proposed a modification in 10 CFR 50.55a(b)(3)(vi) that would require an exercise interval of 2 years for manual valves within the scope of the ASME OM Code in lieu of the exercise interval of 5 years specified in paragraph ISTC-3540 of the ASME OM Code, 1999 Addenda and the 2000 Addenda. Using the Proposed Rules as guidance, an exercise interval of 2 years for manual valves will be applied instead of the 5 year interval given in ISTC-3540. This alternative to the requirements of ISTC 4.2.1 and ISTC 4.2.2 provides an acceptable level of quality and safety.

4.2.2 Licensee's Proposed Alternative Testing

The manual valves listed in Table V-2 will be exercised at least once every 2 years, except where adverse conditions may require the valve to be tested more frequently to ensure operational readiness. The requirements of ISTC-3540 in ASME OMa Code-1999, with a 2 year test interval instead of a 5 year test interval, will be imposed.

Using the provisions of this relief request as an alternative to the specific requirements of ISTC 4.2.1 and ISTC 4.2.2 identified above will provide adequate indication of valve performance and continue to provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i) we request relief from the specific IST[C] Code requirements identified in this relief request.

4.2.3 Evaluation

Active safety-related valves without power actuators, referred to as manual valves, require a plant operator to turn a hand wheel or other device to actuate the valve to its safety position. All

the valves in this relief request are manual Category B valves. The Code requires that Category B valves be exercised to their safety position once every 3 months. Manual valves are not required to meet the Code stroke time testing requirements.

All the manual valves are in the chemical and volume control, auxiliary feedwater, main steam, and service water systems as specified in Table V-2.

The licensee proposes to exercise the manual valves listed in Table V-2 at least once every 2 years, except where adverse conditions require the valve to be tested more frequently to ensure operational readiness. The proposed testing results in approximately an 88-percent reduction in the testing of the specified manual valves, and therefore, a corresponding reduction in the burden of testing these valves, while performing an exercise test at a nominal interval of 2 years.

In a proposed rule amending 10 CFR 50.55a issued in the *Federal Register* on August 3, 2001 (66 FR 40626), the NRC proposed a modification to the requirements for manual valves in ASME OMa-1998, Subsection ISTC, paragraph ISTC 3540, “Manual Valves.” The proposed change to 10 CFR 50.55a(b)(3)(vi) would set that the maximum exercise interval for safety-related manual valves at 2 years unless adverse conditions warranted a shorter exercise interval. The licensee’s proposed alternative provides an adequate frequency for exercising the manual valves to ensure operational readiness of these valves and is consistent with the modification in the rulemaking. Therefore, the proposed alternative provides an acceptable level of quality and safety.

4.2.4 Conclusion

Based on a review of the information provided by the licensee, the staff concludes that the licensee’s proposed alternative to the Code exercise frequency requirements of ISTC 4.2.1 and ISTC 4.2.2 for manual valves is authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the third 10-year interval, based on the alternative providing an acceptable level of quality and safety.

4.3 Relief Request V-3

The licensee has requested relief for the power-operated valves listed in Table V-3 from the test requirements of OM Code, paragraphs ISTC 4.2.4(b), ISTC 4.2.8, and ISTC 4.2.9(b). ISTC 4.2.4(b) requires that the stroke time of all power-operated valves shall be measured to at least the nearest second. ISTC 4.2.8 requires that measured stroke times be compared to the acceptance criteria in this section. ISTC 4.2.9(b) requires that corrective action be taken if the measured stoke times do not meet the acceptance criteria in ISTC 4.2.8.

4.3.1 Licensee’s Basis for Request

> ISTC 1.2(b) excludes “valves used only for system control, such as pressure regulating valves” from the testing requirement of the Code. It is not the intent of the Code to test the regulating function of control valve.
>
> However, if these valves have a safety function to fail to an open of closed position, then the testing requirements for the power-operated valves are imposed. Code Case OMN-8

provides alternative rules for inservice testing of power-operated valves that are used system control and have a fail safe function. The Code Case OMN-8 is given below.

Inquiry: What alternative requirements to those of ASME/ANSI OMa-1988, Part 10, para. 4.2 through OM Code-1995, ISTC 4.2 may be used for power-operated control valves that have only a fail safe safety function?

Reply: It is the opinion of the Committee that the requirements of ASME/ANSI OMa-1988, Part 10, para. 4.2.1.4, Power-Operated Valve Stroke Testing; para. 4.2.1.8, Stroke Time Acceptance Criteria; and para. 4.2.1.9(b) need not be met. All other applicable requirements of para. 4.2 shall be met for ASME/ANSI OMa-1988, Part 10.

Further, the requirements of OM Code-1995, ISTC 4.2.4, Power-Operated Valve Stroke Testing; ISTC 4.2.8, Stroke Time Acceptance Criteria; and ISTC 4.2.9(b) need not be met. All other applicable requirements of paragraph shall be met.

Any abnormality or erratic action experienced during valve exercising shall be recorded in the record of tests, and an evaluation shall be made regarding need for corrective action.

The power-operated control valves listed in Table V-3 have only a fail safe function. We propose applying the alternative rules described in Code Case OMN-8 to the control valves listed in the Table V-3. This alternative to the requirements of ISTC 4.2.4(b), ISTC 4.2.8 and ISTC 4.2.9(b) provides an acceptable level of quality and safety.

Table V-3

Valves Unit-1	Valves Unit-2	OM Category	Function
1-CH-FCV-1113A 1-CH-FCV-1114A	2-CH-FCV-2113A 2-CH-FCV-2114A	B	Alternate Emergency Boration Line Flow Control Valve Primary Grade Water Flow Control Valve
1-FW-HCV-100A 1-FW-HCV-100B 1-FW-HCV-100C	2-FW-HCV-200A 2-FW-HCV-200B 2-FW-HCV-200C	B	Standby Auxiliary Feedwater Supply Hand Control Valves
1-FW-PCV-159A 1-FW-PCV-159B	2-FW-PCV-259A 2-FW-PCV-259B	B	Auxiliary Feedwater Pressure Control Valves
1-HV-PCV-1235A1 1-HV-PCV-1235B1 1-HV-PCV-1235C1	2-HV-PCV-2235A1 2-HV-PCV-2235B1 2-HV-PCV-2235C1	B	Control Room Condenser Water Bypass Pressure Control Valves
1-HV-PCV-1235A2 1-HV-PCV-1235B2 1-HV-PCV-1235C2	2-HV-PCV-2235A2 2-HV-PCV-2235B2 2-HV-PCV-2235C2	B	Control Room Condenser Water Line Pressure Control Valve

1-MS-PCV-101A 1-MS-PCV-101B 1-MS-PCV-101C	2-MS-PCV-201A 2-MS-PCV-201B 2-MS-PCV-201C	B	Main Steam Header Discharge to Atmosphere Pressure Control Valves
1-SI-HCV-1936	2-SI-HCV-2936	B	Waste Gas from Accumulators to Charcoal Filter Line Hand Control Valve
1-SW-TCV-102A 1-SW-TCV-102B 1-SW-TCV-102C	2-SW-TCV-202A 2-SW-TCV-202B 2-SW-TCV-202C	B B B	Service Water from Charging Pump Lube Oil Cooler Temperature Control Valves

4.3.2 Licensee's Proposed Alternative Testing

As an alternative, the licensee proposes to adopt Code Case OMN-8, and to test the control valves listed in Table V-3 to the requirements of Code Case OMN-8.

4.3.3 Evaluation

North Anna Power Station, Units 1 and 2, IST program will comply with the ASME *Code for Operation and Maintenance of Nuclear Power Plants*, 1995 Edition, with the 1996 Addenda. The OM Code, paragraph ISTC 4.2.4(b), requires that the stroke time of all power-operated valves be measured to at least the nearest second. The measured stroke times are to be compared to the acceptance criteria in paragraph ISTC 4.2.8, and paragraph 4.2.9(b) requires that corrective action be taken if the measured stroke times do not meet the acceptance criteria in ISTC 4.2.8.

All power-operated valves are in the chemical and volume control, auxiliary feedwater, control room air conditioning, main steam, safety injection, and service water systems as specified in the Table V-3.

In lieu of the provisions of ASME OM Code, the licensee has proposed to implement the provisions of the Code Case OMN-8, "Alternative Rules for Preservice and Inservice Testing of Power-Operated Valves that are used for System Control and have a Safety Function per OM-10." Under Code Case OMN-8, the Code states that the requirements of OM Code-1995, ISTC 4.2.4, "Power-Operated Valve Stroke Testing"; ISTC 4.2.8, "Stroke Time Acceptance Criteria"; and ISTC 4.2.9(b) need not be met. All other applicable requirements of paragraph ISTC 4.2.4(b) shall be met. Code Case OMN-8 states that any abnormality or erratic action experienced during valve exercising shall be recorded in the record tests and an evaluation shall be made regarding the need for corrective action.

ISTC 1.2(b) excludes "valves used only for system control, such as pressure regulating valves." from the testing requirement of the Code. It is not the intent of the Code to test the regulating function of control valves. However, if these valves have a safety function to fail in an open or closed position, then the testing requirements for the power-operated valves are imposed. Code Case OMN-8 provides alternative rules for inservice testing of power-operated valves that are used for system control and have a fail-safe function.

The licensee will use the proposed criteria in Code Case OMN-8. The staff finds that the criteria in Code Case OMN-8 are technically adequate and provide reasonable assurance of the operational readiness of valves.

4.3.4 Conclusion

Based on a review of the information provided by the licensee, the staff concludes that the licensee's proposed alternative to use Code Case OMN-8 in lieu of the requirements of Code paragraphs ISTC 4.2.4, ISTC 4.2.8, and ISTC 4.2.9(b), for power- operated valves is authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the third 10-year interval, based on the alternative providing an acceptable level of quality and safety.

5.0 REFERENCES

1. Letter from L. N. Hartz, Virginia Electric and Power Company, to Nuclear Regulatory Commission, "Virginia Electric and Power Company, North Anna Power Station Units 1 and 2, Inservice Testing Program for Pumps and Valves for Third Ten year Interval," dated June 4, 2001.

2. Letter from L. N. Hartz, Virginia Electric and Power Company to Nuclear Regulatory Commission, "Virginia Electric and Power Company, North Anna Power Station Units 1 and 2, Inservice Testing Program for Pumps and Valves for Third Ten Year Interval Update Request for Additional Information," dated October 25, 2001.

3. North Anna Power Station Units 1 and 2, Updated Final Safety Analysis Report (UFSAR), Revision 36, dated September 9, 2001.

4. The following pump curves (from Reference 2) are included in this safety evaluation as a reference for Relief Request No. P-6.

   - Outside Recirculation Spray Pump 1-RS-P-2A (Figure No. P-6.3)
   - Outside Recirculation Spray Pump 1-RS-P-2B (Figure No. P-6.4)
   - Outside Recirculation Spray Pump 2-RS-P-2A (Figure No. P-6.5)
   - Outside Recirculation Spray Pump 2-RS-P-2A (Figure No. P-6.6)

5. Safety evaluation of relief requests for second 10-year interval inservice test program plan, Seabrook Station, Unit No. 1 (TAC No. MA8532), dated November 1, 2000.

Principal Contributors: G.S. Bedi
J. Colaccino

Date: January 28, 2002