July 2, 2004

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

SUBJECT: SURRY POWER STATION, UNITS 1 AND 2 - AMERICAN SOCIETY OF MECHANICAL ENGINEERS INSERVICE TESTING PROGRAM (TAC NOS. MC0120 THROUGH MC0146)

Dear Mr. Christian:

By letter dated June 25, 2003, as supplemented by letter dated December 17, 2003, Virginia Electric and Power Company requested relief from certain American Society of Mechanical Engineers (ASME) inservice testing (IST) requirements for components at Surry Power Station, Units 1 and 2. The Nuclear Regulatory Commission (NRC) staff has completed its review of these relief requests, and our evaluations and conclusions are contained in the enclosed Safety Evaluation.

Regarding Surry, Unit 1, the NRC staff finds that the licensee's proposed alternatives in Relief Requests P-1, P-3, P-4, P-5, P-6, P-7, V-2, V-3, V-4, V-5, and V-6 provide an acceptable level of quality and safety, and these proposed alternatives are authorized pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(a)(3)(i). These 11 alternatives are authorized for the fourth 10-year IST interval at Surry, Unit 1.

In addition, the NRC staff has completed its review of Relief Request P-2 for Surry, Unit 1, and has determined that imposing certain ASME Code requirements is impractical. Therefore, the licensee's request for relief is granted pursuant to 10 CFR 50.55a(f)(6)(i) for the fourth 10-year IST interval. Granting relief 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. Additionally, the following conditions are imposed by the NRC staff pursuant to 10 CFR 50.55a(f)(6)(i):
(1) During either refueling outages or cold shutdowns, pumps 1-RH-P-1A and 1-RH-P-1B shall be tested prior to being put into service and declared operable. This test will remain valid for a period of 3 months. (2) During refueling outages or cold shutdowns that extend beyond a 3-month period, the licensee shall test these pumps once every 3 months. (3) During back-to-back refueling outages or cold shutdowns that occur beyond any 3-month test period, the licensee shall test these pumps once every 3 months.

The NRC staff has reviewed Relief Request P-8 for Surry, Unit 1. The NRC staff finds that the proposed alternative to test Containment Spray Pumps 1-CS-P-1A and 1-CS-1B at approximately 50 percent of design flow and to conduct a pre-service test at two points on the pump curve does not provide an acceptable level of quality or safety because the alternative does not provide reasonable assurance of the operational readiness of the containment spray

pumps to perform their safety functions at design-basis conditions. For the long-term assessment of the operational readiness of these pumps, it is necessary that a test be performed at or near each pump's design flow rate or where the pump design performance characteristics are well represented.

In addition, the licensee did not demonstrate in Relief Request P-8 that compliance with the ASME Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Although the need to implement plant modifications at an estimated cost of $879,000 (necessary to test the pumps at or near the pump's design flow rate) may be a hardship, these one-time modifications will provide the ASME Code-required testing capability that is needed in order to verify operational readiness of the containment spray pumps at design-basis conditions. This capability to perform a full-flow test, as required by the comprehensive pump test (CPT), provides a significant increase in the level of quality and safety commensurate with the associated costs. Consequently, the CPT will provide a technically sound evaluation and reliable assessment of the pump's operational readiness and performance characteristics under design-basis accident conditions. This evaluation and assessment of design performance provides reasonable assurance that the containment spray system will accomplish its safety-related functions.

Finally, the licensee did not adequately demonstrate that meeting the requirements of the CPT is impractical. The NRC staff finds that the approach proposed by the licensee in its submittal did not consider less costly alternatives. Therefore, Relief Request P-8 for Surry, Unit 1, is denied.

The NRC staff has reviewed Relief Request P-9 for Surry, Unit 1. The NRC staff finds that the proposed alternative to test Recirculation Spray Pumps 1-RS-P-2A and 1-RS-2B at approximately 36 percent of design flow and to conduct a pre-service test at a single point on the pump curve does not provide an acceptable level of quality or safety because the alternative does not provide reasonable assurance of the operational readiness of the recirculation spray pumps to perform their safety functions at design-basis conditions. For the long-term assessment of the operational readiness of these pumps, it is necessary that a test be performed at or near each pump's design flow rate or where the pump design performance characteristics are well represented.

In addition, the licensee did not demonstrate in Relief Request P-9 that compliance with the ASME Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Although the need to implement plant modifications at an estimated one-time cost of $1,300,000 (necessary to test the pumps at or near the pump's design flow rate) may be a hardship, these modifications will provide the ASME Code-required testing capability needed in order to verify operational readiness of the containment spray pumps at design-basis conditions. This capability to perform a full-flow test as required by the CPT provides an increase in the level of quality and safety commensurate with the associated costs. Consequently, the CPT will provide a technically sound evaluation and reliable assessment of the pump's operational readiness and performance characteristics under design-basis accident conditions. This evaluation and assessment of design performance provides reasonable assurance that the recirculation spray system will accomplish its safety-related functions.

Finally, the licensee has not adequately demonstrated that meeting the requirements of the CPT is impractical. The NRC staff finds that the approach proposed by the licensee in its submittal has not considered less costly alternatives. Therefore, Relief Request P-9 for Surry, Unit 1, is denied.

Regarding Surry, Unit 2, the NRC staff finds that the licensee's proposed alternatives in Relief Requests P-1, P-3, P-4, P-5, V-2, V-3, V-4, and V-5 provide an acceptable level of quality and safety. Therefore, these alternatives are authorized pursuant to 10 CFR 50.55a(a)(3)(i). These eight alternatives are authorized for the fourth 10-year IST interval at Surry, Unit 2.

Regarding Relief Request P-2, the NRC staff has determined that imposing certain ASME Code requirements is impractical. Therefore, the licensee's request for relief is granted pursuant to 10 CFR 50.55a(f)(6)(i) for the fourth 10-year IST interval. Granting relief 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. Additionally, the following conditions are imposed by the NRC staff pursuant to 10 CFR 50.55a(f)(6)(i): (1) During either refueling outages or cold shutdowns, pumps 2-RH-P-1A and 2-RH-P-1B shall be tested prior to being put into service and declared operable. This test will remain valid for a period of 3 months. (2) During refueling outages or cold shutdowns that extend beyond a 3-month period, the licensee shall test these pumps once every 3 months. (3) During back-to-back refueling outages or cold shutdowns that occur beyond any 3-month test period, the licensee shall test these pumps once every 3 months.

The NRC staff has reviewed Relief Request P-6 for Surry, Unit 2. The NRC staff finds that the proposed alternative to test Containment Spray Pumps 2-CS-P-1A and 2-CS-1B at approximately 50 percent of design flow and to conduct a pre-service test at two points on the pump curve does not provide an acceptable level of quality or safety because the alternative does not provide reasonable assurance of the operational readiness of the containment spray pumps to perform their safety functions at design-basis conditions. For the long-term assessment of the operational readiness of the pump, it is necessary that a test be performed at or near each pump's design flow rate or where the pump design performance characteristics are well represented.

In addition, the licensee did not demonstrate in Relief Request P-6 that compliance with ASME Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Although the need to implement plant modifications at an estimated one-time cost of $879,000 (necessary to test the pumps at or near the pump's design flow rate) may be a hardship, these modifications will provide the ASME Code-required testing capability needed in order to verify operational readiness of the containment spray pumps at design-basis conditions. This capability to perform a full-flow test, as required by the CPT, provides an increase in the level of quality and safety commensurate with the associated costs. Consequently, the CPT will provide a technically sound evaluation and reliable assessment of the pump's operational readiness and performance characteristics under design-basis accident conditions. This evaluation and assessment of design performance provides reasonable assurance that the containment spray system will accomplish its safety-related functions.

Finally, the licensee has not adequately demonstrated that meeting the requirements of the CPT is impractical. The NRC staff finds that the approach proposed by the licensee in its

submittal has not considered less costly alternatives. Therefore, Relief Request P-6 for Surry, Unit 2, is denied.

The NRC staff has reviewed Relief Request P-7 for Surry, Unit 2. The NRC staff finds that the proposed alternative to test Recirculation Spray Pumps 2-RS-P-2A and 2-RS-2B at approximately 36 percent of design flow and to conduct a pre-service test at a single point on the pump curve does not provide an acceptable level of quality or safety because the alternative does not provide reasonable assurance of the operational readiness of the recirculation spray pumps to perform their safety functions at design-basis conditions. For the long-term assessment of the operational readiness of the pump, it is necessary that a test be performed at or near each pump's design flow rate or where the pump design performance characteristics are well represented.

In addition, the licensee did not demonstrate in Relief Request P-7 that compliance with ASME Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Although the need to implement plant modifications at an estimated one-time cost of $1,300,000 (necessary to test the pumps at or near the pump's design flow rate) may be a hardship, these modifications will provide the ASME Code-required testing capability to verify operational readiness of the containment spray pumps at design-basis conditions. This capability to perform a full-flow test, as required by the CPT, provides an increase in the level of quality and safety commensurate with the associated costs. Consequently, the CPT will provide a technically sound evaluation and reliable assessment of the pump's operational readiness and performance characteristics under design-basis accident conditions. This evaluation and assessment of design performance provides reasonable assurance that the recirculation spray system will accomplish its safety-related functions.

Finally, the licensee has not adequately demonstrated that meeting the requirements of the CPT is impractical. The NRC staff finds that the approach proposed by the licensee in its submittal has not considered less costly alternatives. Therefore, Relief Request P-7 for Surry, Unit 2, is denied.

In Relief Request V-1 for Surry, Units 1 and 2, the licensee proposed to use ASME OM 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." This Code case has been found acceptable by the NRC staff in Regulatory Guide 1.192, "Operation and Maintenance Code Case Acceptability, ASME OM Code," dated June 2003 and may be used without further NRC review and approval. Therefore, the licensee's request for authorization of Relief Request V-1 is unnecessary, and no further action is required by the NRC staff.

This completes the NRC staff's activities associated with TAC Nos. MC0120 through MC0146.

Sincerely,

/RA/

Stephanie Coffin, Chief, Section 1
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-280 and 50-281

Enclosure: As stated

cc w/encl: See next page

This completes the NRC staff's activities associated with TAC Nos. MC0120 through MC0146.

Sincerely,

/RA/

Stephanie Coffin, Chief, Section 1
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-280 and 50-281

Enclosures: As stated

cc w/encl: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO THE FOURTH10-YEAR INTERVAL INSERVICE TESTING PROGRAM

SURRY POWER STATION, UNITS 1 AND 2

VIRGINIA ELECTRIC AND POWER COMPANY

DOCKET NOS. 50-280 AND 50-281

1.0 INTRODUCTION

By letter dated June 25, 2003, as supplemented by letter dated December 17, 2003, Virginia Electric and Power Company (the licensee) submitted the fourth 10-year inservice testing (IST) program plan for pumps and valves at Surry Power Station, Units 1 and 2. Included within this plan were a number of relief requests for Surry, Units 1 and 2. The licensee submitted nine relief requests for pumps (P-1 through P-9) and six relief requests for valves (V-1 through V-6) for Surry, Unit 1. Furthermore, the licensee submitted seven relief requests for pumps (P-1 through P-7) and five relief requests for valves (V-1 through V-5) for Surry, Unit 2.

The Surry fourth 10-year IST interval began on May 10, 2004, and ends on May 9, 2014. The IST program for pump testing was developed in accordance with the requirements of the 1998 Edition up to and including the 2000 Addenda of the American Society of Mechanical Engineers (ASME) *Code for Operation and Maintenance of Nuclear Power Plants* (OM Code).

2.0 REGULATORY EVALUATION

Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a requires that IST of certain ASME Code Class 1, 2, and 3 pumps and valves be performed in accordance with the ASME *Boiler and Pressure Vessel Code* (ASME Code), Section XI and applicable addenda, except where alternatives have been authorized or relief has been requested by the licensee and granted by the Commission pursuant to paragraphs (a)(3)(i), (a)(3)(ii), or (f)(6)(i) of 10 CFR 50.55a. In proposing alternatives or requesting relief, the licensee must demonstrate that: (1) the proposed alternative provides 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 its facility. Section 50.55a of 10 CFR authorizes the Commission to approve alternatives and to grant relief from ASME Code requirements upon making the necessary findings. NRC guidance contained in Generic Letter (GL) 89-04, “Guidance on Developing Acceptable Inservice Testing Programs,” provides alternatives to the Code requirements that are acceptable to the NRC staff. Further guidance is given in GL 89-04, Supplement 1, and NUREG-1482, “Guidelines for Inservice Testing at Nuclear Power Plants.”

The Code of record for the fourth 10-year IST interval at Surry, Units 1 and 2, is the 1998 Edition up to and including the 2000 Addenda of the ASME OM Code.

3.0 TECHNICAL EVALUATION

The NRC staff has reviewed the licensee's regulatory and technical analyses in support of the request for relief from the Subsection ISTB inservice test requirements of the ASME OM Code, which are described in Attachments 2 and 3 of the licensee's submittal.

3.1 Surry, Unit 1, Relief Request P-1

In its submittal, the licensee requested relief from the vibration testing requirements of paragraph ISTB-3300 of the OM Code for the components listed in Table P-1. ISTB-3300 requires that reference values be determined from the results of pre-service testing or from the results of the first inservice test.

3.1.1 Component Identification

The components affected by this relief request are as listed in the table below.

Pump Number	System	Code Class	OM Group	Description
1-CC-P-1B	Component Cooling	3	A	Component Cooling Water (CCW) Pump
1-CC-P-2A	Component Cooling	3	A	Charging Pump Cooling Water Pump
1-CH-P-1B 1-CH-P-1C	Chemical and Volume Control	2	A	High Head Safety Injection / Charging Pumps
1-CH-P-2B	Chemical and Volume Control	2	A	Boric Acid Transfer Pump
1-SW-P-10A	Service Water	3	A	Charging Pump Service Water Pump
1-VS-P-1A 1-VS-P-1B 1-VS-P-1C 1-VS-P-1D	Ventilation	3	A	Main Control Room Air Conditioning System Condenser Water Pumps
1-VS-P-2C 1-VS-P-2D 1-VS-P-2E	Ventilation	3	A	Main Control Room Air Conditioning System Chilled Water Pumps

3.1.2 Licensee's Basis for Requesting Relief

The pumps listed in Table P-1 have at least one vibration reference value (Vr) that is currently less than 0.05 inches per second (ips). Small values for Vr produce small acceptable ranges for pump operation. The acceptable ranges are defined in Tables ISTB-5100-1, ISTB-5200-1, ISTB-5300-1 and ISTB-5300-2 as less than or equal to 2.5Vr. Based on a small acceptable range, a smooth running pump could be subject to unnecessary corrective action.

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

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

When new reference values are established per ISTB-3310, ISTB-3320 or ISTB-6200(c), the measured parameters will be evaluated for each location to determine if the provisions of this relief request still apply. If the measured Vr is greater than 0.05 ips, the requirements of ISTB-3300 will be applied even if the pump is listed in Table P-1. Conversely, if the measured Vr is less than 0.05 ips, a minimum value of 0.05 ips will be used for Vr even if the pump is not currently listed in Table P-1.

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

- vibration monitoring and analysis beyond that required by ISTB, and
- oil sampling and analysis where applicable (e.g., for pumps with sufficiently large oil reservoirs).

If the measured parameters are outside the normal operating range or are determined by analysis to be trending toward 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-3300 provides an acceptable level of quality and safety.

3.1.3 Proposed Alternate 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 Surry 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-3300 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 50.55(a)(3)(i) we request relief from the specific ISTB Code requirements identified in this relief request.

3.1.4 Staff Evaluation

Pumps with vibration levels 0.1 ips or less are generally considered “smooth running pumps.” The proposed minimum vibration level is well below this point. In addition, the ISTB Alert Range for pumps that operate with a pump speed greater than 600 rpm is 0.325 to 0.7 ips. Action is required for vibration greater than 0.7 ips. All pumps listed in Table P-1 of the licensee’s submittal operate with pump speeds greater than 600 rpm. It is also noted that for very small reference values, hydraulic noise and instrument error can be a significant portion of the reading and affect the repeatability of subsequent measurements. The use of very small or non-repeatable measurements may result in unneeded test or maintenance. Therefore, the proposal to use 0.05 ips as a starting point in the evaluation of vibration velocity is conservative and appropriate.

However, there may be cases where the proposed minimum may not be appropriate. Therefore, if the licensee chooses to include components other than those listed in Table P-1, an evaluation should be performed, including a reference to manufacturer’s recommendation to assure the minimum reference value is appropriate.

On these bases, the NRC staff finds that the licensee’s alternative provides adequate indication of pump performance and an acceptable level of quality and safety. This alternative to the requirements of ISTB-3300, Tables ISTB-5100-1, ISTB-5200-1, ISTB-5300-1, and ISTB-5300-2 provides an acceptable level of quality and safety. Therefore, the alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the fourth 10-year IST interval at Surry, Unit 1.

3.2 <u>Surry, Unit 1, Relief Request P-2</u>

The licensee has requested relief from OM Code Table ISTB-3400-1. Table ISTB-3400-1 requires an inservice test be run on each Group A pump nominally every 3 months.

3.2.1 Component Identification

The components affected by this relief request are Residual Heat Removal (RHR) Pumps 1-RH-P-1A and 1-RH-P-1B. These pumps are classified as Group A pumps in the IST Program and function to remove decay heat from the reactor core and the reactor coolant system during plant cool down.

3.2.2 Licensee's Basis for Requesting Relief

The residual heat removal pumps are located inside 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). The RHR motor operated suction and discharge isolation valves are interlocked with an output signal from RCS pressure transmitters that prevent the valves from being opened when the RCS pressure exceeds 490 psig. Therefore, testing the residual heat removal pumps during normal operation is not practical.

3.2.3 Proposed Alternate Testing

These pumps will be tested every cold shutdown. For a cold shutdown or reactor refueling that extends longer than three months, the pumps will be tested every three months in accordance with [ISTB-3400-1]. However, it is not the intent of this relief request to require a testing interval that is less than three months, either for extended outages or back-to-back outages.

Using the provisions of this relief request as an alternative to the specific requirements of Table ISTB-3400-1 identified above[,] that have been determined 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.

3.2.4 Staff Evaluation

RHR pumps 1-RH-P-1A and 1-RH-P-1B are low-pressure (600 psig design pressure) pumps that take suction from the RCS hot leg, pass flow through the residual heat exchangers, and discharge to the RCS cold leg. These pumps are in a standby condition during power operation and only activate when the RCS is at a low pressure and the RHR system is needed. The RHR system is a low-pressure system controlled by two motor-operated valves that are interlocked with RCS pressure transmitters to prevent the valves from being opened whenever the RCS system pressure exceeds 450 psig (Surry UFSAR Section 9.3.3.2). These pumps are classified as Group A pumps in the IST Program.

The ASME OM Code, Table ISTB-3400-1, requires that a Group A test be performed quarterly on each Group A pump. However, in accordance with 10 CFR 50.55a(f)(6)(i), the licensee has requested relief from the above ISTB Code requirements because they have determined that quarterly testing during normal operation is impractical. The licensee has proposed an alternative to the Table ISTB-3400-1 requirements that would allow it to test the Group A pumps during every cold shutdown or refueling outage without performing this test during testing intervals that are less than 3 months.

The NRC staff has reviewed the Table ISTB-3400-1 requirements and has determined that due to the standby condition of the RHR pumps and the isolation of the RHR system during power operation, compliance with the quarterly testing requirements is not practical. Major plant and system modifications would be needed in order to implement the Code-required quarterly testing of the RHR pumps. These modifications would be costly and burdensome for the licensee.

As an alternative to the Table ISTB-3400-1 requirements, the licensee has proposed to test the RHR 1-RH-P-1A and 1-RH-P-1B pumps every cold shutdown, but no more frequently than once every 3 months. The NRC staff finds that while the licensee's proposal meets the intent of the Table ISTB-3400-1 requirements, additional requirements are needed to ensure that the pumps are performing adequately. Therefore, the licensee shall perform the following actions. (1) During either refueling outages or cold shutdowns, pumps 1-RH-P-1A and 1-RH-P-1B shall be tested prior to being put into service and declared operable. This test will remain valid for a period of 3 months. (2) During refueling outages or cold shutdowns that extend beyond a 3-month period, the licensee shall test these pumps once every 3 months. (3) During back-to-back refueling outages or cold shutdowns that occur beyond any 3-month test period, the licensee shall test these pumps once every 3 months.

The NRC staff finds that the licensee's alternative testing, in conjunction with the conditions described above, meets the intent of the Code and will ensure that the pumps are able to perform their desired functions. Therefore, in accordance with 10 CFR 50.55a(f)(6)(i) and for the fourth 10-year IST interval, relief is granted from the the requested ASME Code requirements. Additionally, the following conditions are imposed by the NRC staff pursuant to 10 CFR 50.55a(f)(6)(i): (1) During either refueling outages or cold shutdowns, pumps 1-RH-P-1A and 1-RH-P-1B shall be tested prior to being put into service and declared operable. This test will remain valid for a period of 3 months. (2) During refueling outages or cold shutdowns that extend beyond a 3-month period, the licensee shall test these pumps once every 3 months. (3) During back-to-back refueling outages or cold shutdowns that occur beyond any 3-month test period, the licensee shall test these pumps once every 3 months.

3.3 Surry, Unit 1, Relief Request P-3

The licensee has requested relief from ISTB-5222 and ISTB-5223. ISTB-5222 requires that Group B tests be conducted with the pump operating at a specified reference point. ISTB-5223 requires that comprehensive tests be conducted with the pump operating at a specified reference point.

3.3.1 Component Identification

The components affected by this relief request are Emergency Service Water Pumps 1-SW-P-1A, 1-SW-P-1B, and 1-SW-P-1C. These pumps are classified as Group B pumps in the IST Program and function to supply the required service water to the canal to provide for minimum safeguards operation in the unlikely event of a loss of site power coincident with a design-basis accident.

3.3.2 Licensee's Basis for Requesting Relief

> The emergency service water pumps take suction from the James River and discharge into the intake canal. The James River near the plant is subject to a tide level variation of approximately five feet. Therefore, the total static head for the system can vary from

test to test. There are no valves in the lines to throttle flow and to compensate for the change in system static head. The only way to duplicate flow and differential pressure from test to test is to perform the test at the same tide level each time. Trying to perform this test within a small enough tide level range to produce repeatable results has proven impractical. To compensate for the change in total system head, a pump reference curve will be prepared based on test results taken at different tide levels. Tests will be conducted within the tide level limits of the curve, and results will be compared to acceptance criteria based on the reference curve and the ranges given in Table ISTB-5200-1. Inlet pressure will be calculated from tide level. 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-5222 and ISTB-5223 provides an acceptable level of quality and safety.

3.3.3 Proposed Alternate Testing

The licensee has proposed that tests be conducted within the tide level limits of the pump reference curve and that flow be compared to acceptance criteria based on the reference curve.

3.3.4 Staff Evaluation

The Group B emergency service water pumps 1-SW-P-1A, 1-SW-P-1B, and 1-SW-P-1C are vertical line shaft pumps that are located in an essentially fixed-resistance system. There are no installed provisions such as throttle valves for varying the system flow rate or differential pressures. The system has a variable inlet pressure or static head, which is due to the height of water above the pump suction. This static head will vary slightly due to changes in the tide level of the James River.

Sections ISTB-5222 and ISTB-5223 of the ASME OM Code outline the test acceptance criteria for vertical line shaft and centrifugal pumps. They require that Group B (ISTB-5222) and comprehensive (ISTB-5223) tests be conducted with the pump operating at a specified reference point. However, in accordance with 10 CFR 50.55a(a)(3)(i), the licensee has requested relief from the above ISTB Code requirements because tidal level variations in the James River prevent the emergency service water pumps 1-SW-P-1A, 1-SW-P-1B, and 1-SW-P-1C from operating at a specified reference point. As such, the licensee has proposed an alternative to the ISTB-5222 and ISTB-5223 requirements that would enable the tests to be conducted within the tide level limits of the pump reference curve, and results would be compared to acceptance criteria based on the reference curve and ranges given in Table ISTB-5200-1. The licensee also stated that the guidelines set forth in Code Case OMN-9, "Use of a Pump Curve for Testing," would be followed.

The NRC staff has reviewed the ISTB-5222 and ISTB-5223 requirements and has determined that it may not be practical to produce repeatable results from the Group B and comprehensive tests, and perform a test on the applicable pumps at a specified reference point due to the tidal level variations of the James River. Therefore, in accordance with Regulatory Guide (RG) 1.192, if adjustment to a specific reference value is not practical when testing a centrifugal or

vertical line shaft pump, the licensee may follow the guidelines outlined in Code Case OMN-9 in lieu of the ISTB-5222 and ISTB-5223 requirements. Code Case OMN-9 states that testing using a reference curve may be acceptable if the following elements are incorporated into the IST program test procedures and curve(s) development:

a. Curves are developed, or manufacturer's pump curves are validated, when the pumps are known to be operating acceptably.

b. The reference points used to develop or validate the curves are measured using instruments at least as accurate as required by the Code.

c. Curves are based on an adequate number of data points, with a minimum of three.

d. Points are beyond the "flat" portion (low rates of the curve in a range which includes or is as close as practicable to design-basis flow rates).

e. Acceptance criteria based on the curves does not conflict with Technical Specifications (TS) or Facility Safety Analysis Report operability criteria for flow rate and differential pressure for the affected pumps.

f. If vibration levels vary significantly over the range of pump conditions, a method for assigning appropriate vibration acceptance criteria should be developed for regions of the pump curve.

g. When the reference curve may have been affected by repair, replacement, or routine service, a new reference curve shall be determined or the previous curve revalidated by an inservice test.

Based on the above information, the NRC staff has determined that the use of the guidelines set forth in RG 1.192 and OMN-9 when used with the alternative may be applied during the IST of emergency service water pumps 1-SW-P-1A, 1-SW-P-1B, and 1-SW-P-1C. Further, the NRC staff has determined that the licensee's proposed alternative will provide adequate indication of pump performance and will provide an acceptable level of quality and safety. The pumps will be tested within the tide level limits of the pump curve, and the results will be compared to acceptance criteria based on the reference curve and the ranges given in Table ISTB-5200-1.

The NRC staff has determined that the above requirements will meet the intent of the OM Code and will provide an acceptable level of quality and safety while also ensuring that the pumps are able to perform their intended safety functions. Therefore, in accordance with 10 CFR 50.55a(a)(3)(i), the alternative is authorized for the fourth 10-year IST interval at Surry, Unit 1.

3.4 Surry, Unit 1, Relief Request P-4

The licensee has requested relief from ISTB-5121 and ISTB-5123. ISTB-5121 requires that Group A tests be conducted with the pump operating at a specified reference point. ISTB-5123 requires that comprehensive tests be conducted with the pump operating at a specified reference point.

3.4.1 Component Identification

The components affected by this relief request are main control room air conditioning system chiller water pumps 1-VS-P-2A, 1-VS-P-2B, 1-VS-P-2C 1-VS-P-2D, and 1-VS-P-2E. These pumps are classified as Group A pumps in the IST Program and function to circulate chilled water to the main control room and switch gear room air handling units.

3.4.2 Licensee's Basis for Requesting Relief

The chilled water circulating pumps for the main control room air conditioning system service two trains each with ... four air handling units connected in a parallel configuration. Total flow for each pump is determined by summing the recorded flows from flow instruments placed downstream of the four air handling units in one of the trains. Test flow is controlled by throttling a gate valve near each air handling unit, which has proven to be a crude flow control method. Having to throttle to a specific reference flow using the sum of flows from four instruments with a gate valve that is not suited for fine flow control is not very practical.

3.4.3 Licensee's Proposed Alternate Testing

The chilled water circulating 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 requirements of ISTB-5121 and ISTB-5123 provides an acceptable level of quality and safety.

Using the provisions of this relief request as an alternative to the specific requirements of ISTB-5121 and ISTB-5123 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) we request relief from the specific ISTB Code requirements identified in this relief request.

3.4.4 Staff Evaluation

The Group A main control room air conditioning system chiller water pumps 1-VS-P-2A, 1-VS-P-2B, 1-VS-P-2C, 1-VS-P-2D, and 1-VS-P-2E are centrifugal pumps that service two trains each with four air handling units connected in a parallel configuration. The system's flow is spread between these four loads and must be calculated by totaling the four load flows. Adjustment of flow during tests is accomplished via throttling a gate valve near each air handling unit.

Sections ISTB-5121 and ISTB-5123 of the ASME OM Code outline the test acceptance criteria for centrifugal pumps. They require that Group A (ISTB-5121) and comprehensive (ISTB-5123) tests be conducted with the pump operating at a specified reference point. However, in accordance with10 CFR 50.55a(a)(3)(i), the licensee requested relief from the above ISTB Code requirements because the gate valves near each air handling unit provide a crude method of controlling test flow that prevents the chilled water circulating pumps from operating at a specified reference point. As such, the licensee has proposed an alternative to the ISTB-5121 and ISTB-5123 requirements that would enable the chilled water circulating pumps to be tested in a range of flows. The results would then be compared to the acceptance criteria

based on a portion of the pump curve and the hydraulic acceptance criteria given in ISTB. The licensee also stated that the guidelines set forth in Code Case OMN-9, “Use of a Pump Curve for Testing,” would be followed.

The NRC staff has reviewed the ISTB-5121 and ISTB-5123 requirements and has determined that it may not be practical to throttle to a specific reference flow with a gate valve that is not suited for fine flow control. Therefore, in accordance with RG 1.192, if the adjustment to a specific reference value is not practical when testing a centrifugal pump, licensees may follow the rules outlined in Code Case OMN-9. Code Case OMN-9 states that testing using a reference curve may be acceptable if the following elements are incorporated into the IST program test procedures and curve(s) development:

a. Curves are developed, or manufacturer’s pump curves are validated, when the pumps are known to be operating acceptably.

b. The reference points used to develop or validate the curves are measured using instruments at least as accurate as required by the Code.

c. Curves are based on an adequate number of data points, with a minimum of three.

d. Points are beyond the “flat” portion (low rates of the curve in a range which includes or is as close as practicable to design-basis flow rates).

e. Acceptance criteria based on the curves does not conflict with TS or Facility Safety Analysis Report operability criteria for flow rate and differential pressure for the affected pumps.

f. If vibration levels vary significantly over the range of pump conditions, a method for assigning appropriate vibration acceptance criteria should be developed for regions of the pump curve.

g. When the reference curve may have been affected by repair, replacement, or routine service, a new reference curve shall be determined or the previous curve revalidated by an inservice test.

Based on the above information, the NRC staff has determined that the licensee’s proposed alternative meets the intent of the ISTB-5121 and ISTB-5123 requirements and will provide an adequate level of quality and safety when applied during the IST program for the main control room air conditioning system chiller water pumps 1-VS-P-2A, 1-VS-P-2B, 1-VS-P-2C, 1-VS-P-2D, and 1-VS-P-2E. The chilled water circulating 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 the hydraulic acceptance criteria given in ISTB.

The NRC staff has determined that by performing the above requirements the chilled water circulating pumps will be able to perform their desired functions and will provide an adequate level of quality and safety. Therefore, in accordance with 10 CFR 50.55a(a)(3)(i), the alternative is authorized for the fourth 10-year IST interval at Surry, Unit 1.

3.5 Surry, Unit 1, Relief Request P-5

The licensee has requested relief from ISTB-5121 and ISTB-5123. ISTB-5121 requires that "Group A tests shall be conducted with the pump operating at a specified reference point." ISTB-5123 requires that "Comprehensive tests shall be conducted with the pump operating at a specified reference point."

3.5.1 Component Identification

The components affected by this relief request are CCW pumps 1-CC-P-1A and 1-CC-P-1B. The pumps are classified as Group A pumps in the IST Program and function to supply cooling water to transfer heat from heat exchangers containing reactor coolant or other radioactive fluids.

3.5.2 Licensee's Basis for Requesting Relief

> During testing of the component cooling water pumps, flow is adjusted to the reference flow rate using an 18 inch butterfly valve. The butterfly valve is a crude throttling device and does not provide the fine tuning that is required to duplicate the reference flow rate from test to test. Consequently, throttling to the same reference flow rate during each test is not practical.

3.5.3 Proposed Alternate Testing

The licensee proposes to test the CCW pumps in a range of flows and to compare the results to acceptance criteria based on a portion of the pump curve and the hydraulic acceptance criteria given in ISTB. Testing will be in accordance with the guidelines set forth in Code Case OMN-9, "Use of a Pump Curve for Testing."

3.5.4 Staff Evaluation

1-CC-P-1A and 1-CC-P-1B are Group A centrifugal pumps that supply water to the dozens of independent loads provided for by the CCW system. The system's flow is adjusted during tests via the throttling of an 18-inch butterfly valve. Butterfly valves are generally most sensitive in the 15° or 70° open position; however, severe throttling may lead to cavitation. This design limitation makes it difficult to attain a specific reference point.

Sections ISTB-5121 and ISTB-5123 of the ASME OM Code outline the test acceptance criteria for centrifugal pumps. They require that Group A (ISTB-5121) and comprehensive (ISTB-5123) tests shall be conducted with the pump operating at a specified reference point. However, in accordance with 10 CFR 50.55a(a)(3)(i), the licensee has requested relief from the above ISTB Code requirements because the butterfly valve used to adjust the flow to the CCW pumps provides only a crude method of controlling test flow, thus preventing the pumps from operating at a specified reference point. The licensee has proposed an alternative to the ISTB-5121 and ISTB-5123 requirements that would enable the CCW pumps to be tested in a range of flows and to compare the results to acceptance criteria based on a portion of the pump curve and the hydraulic acceptance criteria given in ISTB. The licensee also stated that the guidelines set forth in Code Case OMN-9, "Use of a Pump Curve for Testing," would be followed.

The NRC staff has reviewed the ISTB-5121 and ISTB-5123 requirements. The NRC staff has verified that it may not be practical to throttle the butterfly valve to a specific reference flow since this valve is not suited for fine flow control. Therefore, in accordance with RG 1.192, if the adjustment to a specific reference value is not practical when testing a centrifugal pump, licensees may follow the rules outlined in Code Case OMN-9. Code Case OMN-9 states that testing using a reference curve can be acceptable if the following elements are incorporated into the IST program and procedures for developing and implementing the curve(s):

a. Curves are developed, or manufacturer's pump curves are validated, when the pumps are known to be operating acceptably.

b. The reference points used to develop or validate the curves are measured using instruments at least as accurate as required by the Code.

c. Curves are based on an adequate number of data points, with a minimum of three.

d. Points are beyond the "flat" portion (low rates of the curve in a range which includes or is as close as practicable to design-basis flow rates).

e. Acceptance criteria based on the curves does not conflict with TS or Facility Safety Analysis Report operability criteria for flow rate and differential pressure for the affected pumps.

f. If vibration levels vary significantly over the range of pump conditions, a method for assigning appropriate vibration acceptance criteria should be developed for regions of the pump curve.

g. When the reference curve may have been affected by repair, replacement, or routine service, a new reference curve shall be determined or the previous curve revalidated by an inservice test.

Based on the above information, the NRC staff has determined that the licensee's proposed alternative meets the intent of the ISTB-5121 and ISTB-5123 requirements and will provide an adequate level of quality and safety when applied during the IST program for CCW pumps 1-CC-P-1A and 1-CC-P-1B. The CCW 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 the hydraulic acceptance criteria given in ISTB.

The NRC staff has determined that by performing the above requirements the CCW pumps will be able to perform their desired functions and will provide an adequate level of quality and safety. Therefore, in accordance with 10 CFR 50.55a(a)(3)(i), the alternative is authorized for the fourth 10-year IST interval at Surry, Unit 1.

3.6 Surry, Unit 1, Relief Request P-6

The licensee has requested relief from OM Table ISTB-3500-1 and ISTB-3510(b)(1). Table ISTB-3500-1 requires that Group A test pressure instrument accuracy shall be within ± 2 percent. ISTB-3510(b)(1) requires that the full-scale range of each analog instrument shall be not greater than three times the reference value.

3.6.1 Component Identification

The components affected by this relief request are Boric Acid Transfer Pumps 1-CH-P-2A and 1-CH-P-2B. The pumps are classified as Group A pumps in the IST Program and function to supply boric acid to the suction of the charging pumps for emergency boration.

3.6.2 Licensee's Basis for Requesting Relief

Basis for Relief (Table ISTB-3500-1)

Calibrating the inlet pressure instruments for the boric acid transfer pumps to an accuracy within ± 2% has proven difficult and may be impractical in the future with the current instruments. Calibrating the inlet pressure instruments to an accuracy within ± 3% would be practical.

Basis for Relief (Table ISTB-3510(b)(1))

The inlet pressure gauges have a full scale range of 0 to 15 psig. These instruments were sized by evaluating the static pressures present at the suction side of the pumps and applying the three times rule of ISTB-3510(b)(1). The static pressures range from 6 to 7 psig.

When the pumps are started, the pressure at the suction side of the pumps drops to approximately 2 psig; therefore, the inlet pressure gauges do not meet the three times rule for dynamic inlet pressure.

Using a lower range pressure gauge (i.e. 0 to 5 psig) would meet the three times rule for dynamic inlet pressure; however, the lower range gauge would be repeatedly exposed to an over range condition (static pressures in excess of 5 psig) which would damage the instruments.

Using a lower range temporary gauge on a quarterly basis presents a hardship because the process fluid contains boric acid and is contaminated. If contaminated, the temporary instruments would probably become waste material. However, with the current 0 to 15 psig inlet pressure gauges calibrated to ± 3%, a differential pressure can be determined that exceeds the accuracy requirements for differential pressure.

Each boric acid transfer pump discharge pressure gauge (0 to 150 psig range) has an instrument loop accuracy of 1.59%. Computing the maximum error for differential pressure using the current instrument configuration and an inlet pressure gauge accuracy of ± 3%, yields an error of 2.85 psid.

Computing the Code allowed error for differential pressure for an inlet pressure gauge with a 2% accuracy and a 0 to 5 psig range and a discharge pressure instrument with a 2% accuracy and a 0 to 150 psig range yields an error of 3.1 psid. With the current instrument configuration, the loop accuracy of each discharge pressure instrument could be as high as 1.75%, which equates to a 3.075 psid error, and still be within the Code allowed error of 3.1 psid for differential pressure. Therefore, for purposes of trending pump degradation using differential pressure and flow, the current instrument is

adequate as long as the discharge pressure instrument loop accuracies remain at or below 1.75%.

3.6.3 Proposed Alternate Testing

As an alternative, the licensee has proposed to use inlet pressure gauges with a full-scale range of 0 to 15 psig and calibrated to an accuracy within ± 3 percent in order to measure dynamic inlet pressures. Also, the licensee committed to maintain loop accuracies for the discharge pressure gauges at or below an accuracy of 1.75 percent to ensure that the differential pressure error is below the differential pressure error allowed by the ISTB Code.

3.6.4 Staff Evaluation

The boric acid transfer pumps 1-CH-P-2A and 1-CH-P-2B supply boric acid to the suction of the charging pumps for emergency boration. The inlet pressures to these boric acid transfer pumps vary significantly between their standby and operating modes. The static inlet pressure available to the pumps during operation is 6 to 7 psig. However, when the pumps are started, the inlet pressure drops to about 2 psig. When the inlet pressure drops to 2 psig, ISTB-3510(b)(1) requires that the inlet gauges must have a range of 0 to 6 psig. However, the use of a 0 to 6 psig range gauge would be unsuitable at static inlet pressures due to the possibility of damaging the gauge by over-ranging.

The ASME OM Code, Table ISTB-3500-1 requires that Group A test pressure instrument accuracy be within ± 2 percent, and ISTB-3510(b)(1) requires that the full-scale range of each analog instrument not be greater than three times the reference value. The licensee has requested relief from the above ISTB Code requirements because they have determined that the instruments do not meet the Code accuracy and range requirements for boric acid transfer pumps 1-CH-P-2A and 1-CH-P-2B. As such, the licensee has proposed an alternative to the Table ISTB-3500-1 and ISTB-3510(b)(1) requirements that would test the pumps with 0 to 15 psig, full-scale range inlet pressure gauge, accurate to within ± 3 percent for the measurement of dynamic inlet pressures. Additionally, the licensee stated that the loop accuracies for the discharge pressure gauges will be maintained at or below an accuracy of 1.75 percent to ensure that the differential pressure error is below the differential pressure error allowed by the ISTB Code.

The NRC staff has reviewed the Table ISTB-3500-1 and ISTB-3510(b)(1) requirements. The intent of ISTB is to ensure that the range and accuracy readings obtained from flow and pressure instrumentation are within a range small enough to make degradation monitoring meaningful. The licensee's proposed alternative meets the intent of the ISTB Code requirements. The licensee will calibrate the accuracy of the 0 to 15 psig range inlet pressure gauges to within ± 3 percent and will maintain loop accuracies for the discharge pressure gauges at or below an accuracy of 1.75 percent. This alternative will provide reasonable assurance that the boric acid transfer pumps are operationally ready. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the alternative is authorized on the basis that it provides an acceptable level of quality and safety. The alternative is authorized for the fourth 10-year IST interval at Surry, Unit 1.

3.7 Surry, Unit 1, Relief Request P-7

The licensee has requested relief from OM ISTB-3510(b)(1). ISTB 3510(b)(1) requires that the full-scale range of each analog instrument shall be not greater than three times the reference value.

3.7.1 Component Identification

The components affected by this relief request are charging pump cooling water pumps 1-CC-P-2A and 1-CC-P-2B. The pumps are classified as Group A pumps in the IST Program and function to supply cooling water to transfer heat from the charging pump mechanical seals.

3.7.2 Licensee's Basis for Requesting Relief

> Recently installed inlet pressure gauges have a full scale range of 0 to 3.5 psig. Readings from these inlet pressure gauges over the past year indicate that the dynamic pressures fall within the bottom third of full scale. However, the difference in the error between the 0 to 3.5 psig gauges and gauges that would meet the three times full-scale rule are so small that the 0 to 3.5 psig gauges can be considered to be equivalent in terms of accuracy for determining differential pressure.
>
> For example, inlet pressures as low as 0.8 psig have been recorded for pump 1-CC-P-2B. A gauge that meets the three times full-scale rule would have a full scale of 2.4 psig or less. A 2% accuracy for the 2.4 psig gauge translates to an error of 0.05 psig. A 2% accuracy for the 3.5 psig gauge translates to an error of 0.07 psig. The difference in error of 0.02 psig is insignificant when determining the differential pressures for these pumps which range between 50 and 60 psig. Therefore, the two gauges can be considered to be equivalent in terms of accuracy for determining differential pressure.

3.7.3 Proposed Alternate Testing

The licensee proposes to measure pump suction pressure with gauges that have a full scale of 0 to 3.5 psig.

3.7.4 Staff Evaluation

The charging pump cooling water pumps 1-CC-P-2A and 1-CC-P-2B are Group A, Class 3 pumps that are part of the CCW System. The pumps supply cooling water to transfer heat from the charging pump mechanical seals. These pumps have been recorded to have inlet pressures as low as 0.8 psig and commonly have differential pressures that range from 50 to 60 psig.

The ASME OM Code, ISTB-3510(b)(1) requires that the full-scale range of each analog instrument shall be not greater than three times the reference value. In accordance with 10 CFR 50.55a(a)(3)(i), the licensee has requested relief from ISTB Code requirements because the use of a gauge with a full-scale range of 0 to 3.5 psig would provide an adequate level of quality and safety for the measurement of inlet pressures to the charging pump cooling water pumps 1-CC-P-2A and 1-CC-P-2B.

The NRC staff has reviewed the ISTB-3510(b)(1) requirements and has determined that there would be a negligible accuracy error in determining the differential pressures across these pumps when a 0 to 3.5 psig gauge is used as compared to a gauge that would meet the three times full-scale rule. The use of the inlet pressure gauge with a full-scale range of 0 to 3.5 psig will provide an acceptable level of quality and safety for the operation of the charging pump cooling water pumps. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the alternative is authorized for the fourth 10-year IST interval at Surry, Unit 1.

3.8 Surry, Unit 1, Relief Request P-8

The licensee has requested relief from the comprehensive pump test (CPT) requirements of OM Code, subparagraphs ISTB-3300(e)(1) and ISTB-5110(a). Paragraph ISTB-3300(e)(1) states, “Reference values shall be established within ± 20% of pump design flow rate for the comprehensive test.” ISTB-5110(a) (Pre-service Testing) requires that, "In systems where resistance can be varied, flow rate and differential pressure shall be measured at a minimum of 5 points. If practicable, these points shall be from pump minimum flow to at least pump design flow."

The licensee proposes to perform quarterly OM Code-required testing of the containment spray pumps at approximately 50 percent of minimum design flow in lieu of performing the biennial CPT within ± 20 percent of design flow.

3.8.1 Component Identification

The components affected by this relief request are Containment Spray Pumps 1-CS-P-1A and 1-CS-P-1B. These pumps are classified as Group B pumps in the IST Program. The containment spray pumps provide a cooled, chemically treated, borated spray to reduce containment pressure following a loss-of-coolant accident (LOCA).

3.8.2 Licensee’s Basis for Requesting Relief

The test loop for the containment spray pumps consists of an 8-inch pump discharge line feeding into a 4-inch recirculation line, which connects to a 6-inch header that discharges to the reactor water storage tank (RWST). The containment spray pumps take suction from the RWST. With this 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. During the construction period in 1972, the system was flushed to remove particulate matter that could plug the spray nozzles. A recirculation test was also performed at approximately 50-percent design flow. Pump differential pressure was not recorded for the recirculation test.

The licensee stated that reestablishing this test loop for the purpose of periodic testing would require plant modifications, which would not be practicable. The spray headers are inaccessible without a significant amount of scaffolding. Additionally, the licensee stated that even if the spray headers were accessible, the modification of the system would present a variety of substantial challenges, such as plugging 234 spray nozzles, conducting the flow test, and returning of the system to its operable configuration. Specifically, these challenges are due to the complexity of the temporary modifications, the labor intensive nature of the modifications, and the post-modification testing needed to ensure that the system is returned to the original configuration.

A reference flow rate of at least 2560 gpm is required to be within 20 percent of the pump design flow rate of 3200 gpm. Currently, reference flows are typically established near 1600 gpm, which is approximately 50 percent of design flow. The licensee stated that this is the “highest flow that can be measured while maintaining stable test conditions”; and that “testing at the reference flows will detect pump degradation because the pump curve is well sloped at the point of testing.”

The containment spray pumps are included in the Surry Predictive Maintenance Program. This program employs predictive monitoring techniques for the containment spray pumps, such as vibration monitoring and oil sampling and analysis

The licensee stated that testing the containment spray pumps over the full range of the pump curve and measuring at least five points along the curve is impractical. As an alternative for the pre-service test, the licensee proposed to measure two points at approximately 20 percent and 50 percent of design flow.

3.8.3 Proposed Alternate Testing

The licensee proposes that comprehensive test reference flows be established to within approximately 50 percent of pump design flow and that pre-service tests be conducted using two points on the pump curve at approximately 20 percent and 50 percent of pump design flow. Additionally, the containment spray pumps will be subjected to the testing, trending, and diagnostic analysis requirements of the Surry Predictive Maintenance Program.

3.8.4 Staff Evaluation

The Surry containment spray pumps fall within the scope of the ASME OM Code and are defined as Group B Pumps. As such, these pumps are subject to quarterly Group B tests along with a biennial CPT. Pump speed as well as differential pressure or flow rate are required to be monitored for the Group B test of the containment spray pumps. Additionally, speed, differential pressure, flow rate, discharge pressure, and vibration are required for the comprehensive test. ASME OMb 2000, paragraph ISTB-3300(e)(1) requires the establishment of reference values for the CPT to be within $\pm$ 20 percent of pump design flow. The Code does not define design flow.

In their current configuration, the containment spray pumps are tested using a test line that recirculates flow back to the RWST. Total flow during the quarterly pump test is approximately 1600 gpm. Considering the range of stated flows, the proposed test flow is approximately 20 percent to 50 percent of design flow. The containment spray system flow path currently available that could produce the required flow is a direct suction off the RWST through the containment spray header. This method would spray containment with a solution of sodium hydroxide and borated water and would require an extensive post-test cleanup. This test method would be detrimental to the installed-carbon steel components and non-qualified electrical circuits and is, thus, impractical.

The CPT—which first appeared in the 1995 Edition of the OM Code—results in a more accurate assessment of the pump’s operational readiness and performance characteristics at a reduced frequency (once every refueling cycle versus once every 3 months). The test is intended to be conducted at or near a pump’s design flow rate because this area of the pump curve is

considered to be most representative of the pump's design performance characteristics. The quarterly Group A or B test is primarily a qualitative test to detect gross mechanical or hydraulic failures and not to assess hydraulic performance capabilities or to detect minor imbalances through vibration measurements.

ASME OMb 2000, paragraph ISTB-3300(e)(2) requires reference values for Group B tests to be within ± 20 percent of pump design flow, if practicable. If not practicable, the reference point shall be established at the highest practical flow rate. The licensee states that this is approximately 50 percent of the stated design flow. However, the licensee did not adequately justify how operation at the lower flow confirms the capability of the pump to perform as required under design flow conditions, nor did the licensee indicate how it meets the intent of the CPT.

ASME OMb 2000b, paragraph ISTB 5110(a) requires that flow rate and differential pressure be measured at a minimum of 5 points in systems where flow can be varied. The licensee proposes to test 2 points. Two points can only generate a line and is not adequate to project pump performance at elevated flows.

The licensee stated that the pumps' pre-service testing was a system flush and recirculation test. No vibration measurements were taken and the original test data is not verifiable. Pump test curves were provided; however, the containment spray system has never been operated near design parameters in its as-installed configuration.
The proposed test monitors discharge pressure and pump vibration more frequently than a Group B test. Increased monitoring of pump vibration may detect minor imbalances and may aid in assessment of pump degradation. The use of lube oil sampling and analysis is also a good practice and can aid in the condition assessment of rotating equipment. However, the additional monitoring and sampling does not compensate for not testing at higher flow rates nor do they assess hydraulic performance capabilities under design flow conditions.

In its evaluation of the above point of discussion, the NRC staff finds that the proposed alternative does not provide an acceptable level of quality or safety because the alternative does not provide reasonable assurance of the operational readiness of the containment spray pumps to perform their safety functions at design-basis conditions. For the long-term assessment of the operational readiness of the pump, it is necessary that a test be performed at or near the pump's design flow rate or where the pump design performance characteristics are well represented.

In addition, the licensee did not demonstrate that compliance with ASME OMb Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Although the need to implement plant modifications at an estimated cost of $879,000 (necessary to test the pumps at or near the pump's design flow rate) may be a hardship, these modifications will provide the Code-required testing capability needed to verify operational readiness of the containment spray pumps at design-basis conditions. This capability to perform a full-flow test as required by the CPT provides an increase in the level of quality and safety commensurate with the associated costs. Consequently, the CPT will provide a technically sound evaluation and reliable assessment of the pump's operational readiness and performance characteristics under design-basis accident conditions. This evaluation and assessment of design performance provides reasonable assurance that the containment spray system will accomplish its safety-related functions.

The licensee has not adequately demonstrated that meeting the requirements of the CPT is impractical. The NRC staff finds that the approach proposed by the licensee in its submittal dated June 25, 2003, as supplemented by letter dated December 17, 2003, has not considered less costly alternatives. Therefore, the licensee's request for relief is denied for Relief Request P-8 for Surry, Unit 1.

3.9 Surry, Unit 1, Relief Request P-9

The licensee has requested relief from the CPT requirements of OM Code, subparagraphs ISTB-3300(e)(1) and ISTB-5210(a). Paragraph ISTB-3300(e)(1) states, "Reference values shall be established within ± 20% of pump design flow rate for the comprehensive test." ISTB-5210(a) (Preservice Testing) requires that for systems where resistance can be varied, the flow rate and differential pressure shall be measured at a minimum of 5 points. Furthermore, if practicable, these points shall be from pump minimum flow to at least pump design flow.

The licensee proposes to perform quarterly Code-required testing of the containment spray pumps at approximately 36 percent of minimum design flow in lieu of performing the biennial CPT within ± 20 percent (80 to 120 percent) of design flow.

3.9.1 Component Identification

The components affected by this relief request are Recirculation Spray Pumps 1-RS-P-2A and 1-RS-P-2B. These pumps are classified as Group B pumps in the IST Program. The outside recirculation spray pumps supply borated spray to cool and depressurize the containment atmosphere following a containment depressurization actuation signal and maintain containment subatmospheric pressure following an accident.

3.9.2 Licensee's Basis for Requesting Relief

The outside recirculation pumps are long shaft pumps with the shaft and impeller enclosed in a 52-foot casing. The pump impellers are located near the bottom of the casing. The test loop for the outside recirculation pumps consists of a 10-inch pump discharge line feeding into a 4-inch recirculation line that feeds back to the pump casing. With this test loop, pump design flow cannot be established. Reference flows are typically established with this test loop in the range of 1100 gpm, whereas the pump required flow is 3000 gpm. The discharge piping was not designed to be temporarily reconfigured so that pump design flow could be achieved.

Pre-operational testing was performed in 1972 during initial construction. This consisted of a shutoff head verification test (no flow), a low-flow test through the existing 4-inch test loop, and a system flush to remove particulate matter. Flow was not established to the spray headers. Differential pressures were not measured, and the flows observed during the low-flow test are not verifiable.

A reference flow of 2400 gpm is required to be within 20 percent of the pump design flow of 3000 gpm. The licensee currently established reference flows in the range of 1100 gpm, which is not within 20 percent of design flow. As an alternative to testing at 80 to 120 percent of the design flow, the licensee proposes to establish reference values at 36 percent of design flow or

approximately 1100 gpm. The licensee states that “testing at the reference flows will detect pump degradation because the pump curve is well sloped at the point of testing.”

The outside recirculation pumps are included in the Surry Predictive Maintenance Program. This program employs predictive monitoring techniques for the outside recirculation spray pumps, such as vibration monitoring and oil sampling and analysis.

The licensee states that, “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 for the pre-service test, a single point is proposed to be measured at approximately 36 percent of design flow.

3.9.3 Proposed Alternate Testing

The licensee proposes that a comprehensive test reference flow be established at approximately 36 percent of pump design flow. A pre-service test will be conducted using a single point on the pump curve. The outside recirculation spray pumps are subject to the testing, trending, and diagnostic analysis of the Surry Predictive Maintenance Program.

3.9.4 Staff Evaluation

The Surry outside recirculation spray pumps fall within the scope of the ASME OM Code and are defined as Group B Pumps. As such, these pumps are subject to quarterly Group B tests along with a biennial CPT. Pump speed as well as differential pressure or flow rate are required to be monitored for the Group B test of the outside recirculation spray pumps. Additionally, speed, differential pressure, flow rate, discharge pressure, and vibration are required for the CPT. ASME OMb 2000, paragraph ISTB-3300(e)(1) requires the establishment of reference values for the CPT to be within $\pm$ 20 percent of pump design flow. The Code does not define design flow.

In their current configuration, the recirculation spray pumps are tested using a test line that recirculates flow back to the RWST. Total flow during the quarterly pump test is approximately 1100 gpm. This is approximately 36 percent of the design flow rate of 3000 gpm. There is no recirculation spray system flow path currently available that could produce the required flow. The pumps have never operated in any condition other than in a recirculation mode. Flow has never been established to the spray headers and design-basis capability has never been field verified.

The CPT—which first appeared in the 1995 Edition of the OM Code—results in a more accurate assessment of the pump’s operational readiness and performance characteristics at a reduced frequency (once every refueling cycle versus once every 3 months). The test is intended to be conducted at or near a pump’s design flow rate because this area of the pump curve is considered to be most representative of the pump’s design performance characteristics. The quarterly Group A or B test is primarily a qualitative test to detect gross mechanical or hydraulic failures and not to assess hydraulic performance capabilities or to detect minor imbalances through vibration measurements.

ASME OMb 2000, paragraph ISTB-3300(e)(2) requires reference values for Group B tests to be within $\pm$ 20 percent of pump design flow, if practicable. If not practicable, the reference point

shall be established at the highest practical flow rate. The licensee states that this is approximately 50 percent of the stated design flow. The licensee did not adequately justify how operation at the lower flow confirms the capability of the pump to perform as required under design flow conditions nor how it meets the intent of the CPT.

ASME OMb 2000b, paragraph ISTB-5210(a) requires that flow rate and differential pressure be measured at a minimum of 5 points in systems where flow can be varied. The licensee proposes to test a single point. One point cannot generate a curve and is not adequate to project pump performance at elevated flows.

The licensee stated that the pumps' pre-service testing was a system flush, shut-off head test, and recirculation test. No vibration measurements were taken, and the original test data is not verifiable. Pump test curves were provided; however, the recirculation spray system has never been operated near design parameters in its as-installed configuration.

The proposed test monitors discharge pressure and vibration more frequently than a Group B test. Increased monitoring of vibration may detect minor imbalances and may aid in assessment of pump degradation. The use of lube oil sampling and analysis is also a good practice and can aid in the condition assessment of rotating equipment. However, the additional monitoring and sampling does not compensate for not testing at higher flow rates nor do they assess hydraulic performance capabilities under design flow conditions.

In its evaluation of the above point of discussion, the NRC staff finds that the proposed alternative does not provide an acceptable level of quality or safety because the alternative does not provide reasonable assurance of the operational readiness of the outside recirculation spray pumps to perform their safety functions at design-basis conditions. For the long-term assessment of the operational readiness of the pump, it is necessary that a test be performed at or near the pump's design flow rate or where the pump design performance characteristics are well represented.

In addition, the licensee did not demonstrate that compliance with Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Although the need to implement plant modifications at an estimated cost of $1,300,000 (necessary to test the pumps at or near the pump's design flow rate) may be a hardship, these modifications will provide the Code-required testing capability to verify operational readiness of the containment spray pumps at design-basis conditions. This capability to perform a full-flow test as required by the CPT provides an increase in the level of quality and safety commensurate with the associated costs. Consequently, the CPT will provide a technically sound evaluation and reliable assessment of the pump's operational readiness and performance characteristics under design-basis accident conditions. This evaluation and assessment of design performance provides reasonable assurance that the recirculation spray system will accomplish its safety-related functions.

The licensee has not adequately demonstrated that meeting the requirements of the CPT is impractical. The NRC staff finds that the approach proposed by the licensee in its submittal dated June 25, 2003, as supplemented by letter dated December 17, 2003, has not considered less costly alternatives. Therefore, Relief Request P-9 is denied for Surry, Unit 1.

3.10 Surry, Unit 1, Relief Request V-1

The licensee has requested relief from ISTC paragraphs 5131, 5132, and 5133. ISTC-5131 requires that the stroke time of active pneumatically operated valves shall be measured, a limiting value of full-stroke time shall be specified by the owner, the valve stroke shall be measured to at least the nearest second, and any abnormality or erratic action shall be recorded and evaluated. ISTC-5132 requires that measured stroke times be compared to the acceptance criteria in this section. ISTC-5133 requires that corrective action be taken if the measured stroke times do not meet the acceptance criteria specified in ISTC-5122.

3.10.1 Component Identification

The components affected by this relief request are as listed in the table below.

Valve Number	System	OM Category	ASME Class	Function
1-CC-LCV-101	Component Cooling	B	3	Charging Pump Seal Cooling Surge Tank Level Control Valve
1-CH-FCV-1113A	Chemical and Volume Control	B	3	Alternate Emergency Boration Line Flow Control Valve
1-CH-FCV-1114A	Chemical and Volume Control	B	3	Primary Grade Water Flow Control Valve
1-MS-RV-101A 1-MS-RV-101B 1-MS-RV-101C	Main Steam	B	2	Main Steam Header Discharge to Atmosphere Pressure Control Valves
1-SW-PCV-100A 1-SW-PCV-100B 1-SW-PCV-100C 1-SW-PCV-100D 1-SW-PCV-100E 1-SW-PCV-101A 1-SW-PCV-101B 1-SW-PCV-101C 1-SW-PCV-101D 1-SW-PCV-101E	Service Water	B	3	Control Room Condenser Water System Pressure Control Valves
1-SW-TCV-108A 1-SW-TCV-108B 1-SW-TCV-108C	Service Water	B	3	Service Water to Charging Pump Lube Oil Cooler Temperature Control Valves

3.10.2 Licensee's Basis for Requesting Relief

In its request the licensee stated: "ISTC-1200(b) excludes 'valves used only for system control, such as pressure regulating valves' from the testing requirements of the Code."

The licensee also stated that, “if these valves have a safety function to fail to an open or close position, then the testing requirements for 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 safety function.” The power-operated control valves listed in the table above have only a fail-safe function, and the alternative rules described in Code Case OMN-8 will be applied to the control valves listed in Table V-1 of the licensee’s submittal as an alternative to the requirements of OM Code Sections ISTC-5131, ISTC-5132, and ISTC-5133.

3.10.3 Proposed Alternate Testing

The licensee proposes to test the control valves listed in the table above to the requirements of Code Case OMN-8.

3.10.4 Staff Evaluation

Table V-1 of the licensee’s submittal lists pneumatically operated valves that use compressed air energy to control the movement of the valve stem. These valves function as system control devices and have a fail-safe safety function. These valves are maintained and tested in accordance with the ASME OM Code, Section ISTC-5130, which outlines testing and corrective action procedures for all pneumatically operated valves. Specifically, Subsection ISTC-5131 states that the stroke time of all valves shall be measured to at least the nearest second, the limiting value(s) of full-stroke time of each valve shall be specified by the owner, and any abnormality or erratic action shall be recorded and evaluated. Additionally, Subsection ISTC-5133 requires that corrective action be taken if the measured stroke times do not meet the requirements of ISTC-5132, which outlines acceptance criteria for measured stroke times.

In accordance with 10 CFR 50.55a(a)(3)(i), the licensee has requested relief from the above ASME OM Code requirements in order to implement the provisions of 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, power-operated control valves that have only a fail-safe safety function need not meet the requirements of ASME OM Code-2001, ISTC-5131, “Valve Stroke Testing,” ISTC-5132, “Stroke Test Acceptance Criteria,” and ISTC-5133(b). Code Case OMN-8 has been reviewed and found acceptable by the NRC staff in RG 1.192 dated June 2003, and this version of RG 1.192 has been incorporated by reference into 10 CFR 50.55a.

Therefore, the licensee’s request for authorization of the alternative is unnecessary, and the licensee may use Code Case OMN-8 for its fourth 10-year IST interval at Surry, Unit 1, with no further action required by the licensee or the NRC staff.

3.11 <u>Surry, Unit 1, Relief Request V-2</u>

The licensee has requested relief from ISTC-3630(f). ISTC-3630(f) requires that valves or valve combinations with leakage rates exceeding the values specified by the owner shall be declared inoperable and either repaired or replaced.

3.11.1 Component Identification

The components affected by this relief request are the following RWST Isolation Valves. The valves are Class 2, Category A and A/C.

Valve(s):	1-CH-MOV-1115B	1-SI-MOV-1885A
	1-CH-MOV-1115D	1-SI-MOV-1885B
	1-SI-25	1-SI-MOV-1885C
		1-SI-MOV-1885D

3.11.2 Licensee's Basis for Requesting Relief

Valves 1-CH-MOV-1115B and D, and 1-SI-25 are in the supply line to the charging pumps from the RWST. Valves 1-SI-MOV-1885A, B, C and D are on test lines that run from the discharge of the low head SI [safety injection] pumps to the RWST. During recirculation mode transfer, the RWST is isolated and the low head SI pumps 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 leakages from each valve have been measured and summed, 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 adequately.

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 and hence the system function is satisfied. This evaluation should provide a high level of assurance that delaying the repair or replacement would 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. Evaluations will be documented and retained in plant records, and are available for subsequent review. This alternative to the requirements [of] ISTC-3630(f) provides an acceptable level of quality and safety.

3.11.3 Proposed Alternate Testing

The licensee proposes to perform an evaluation to demonstrate that even if a particular 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 would be 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. This

evaluation would be in addition to repair or replacement activities performed as corrective actions.

3.11.4 Staff Evaluation

Category A valves 1-CH-MOV-1115B and D, 1-SI-25, and 1-SI-MOV-1885A, B, C, and D function to isolate the RWST in order to protect it from the highly contaminated water that is circulated from the containment sump to the reactor vessel during the recirculation mode. These valves do not have leakage requirements based on an owner's 10 CFR 50, Appendix J program, although in accordance with the ASME OM Code, Section ISTC-3630 and Paragraph ISTC-3630(a), they shall be tested biennially in order to verify that their seat leakages are within acceptable limits. If a valve's seat leakage rate exceeds the specified value set by the owner, Paragraph ISTC-3630(f) requires corrective actions to be performed on the valve that would declare it inoperable and have it either be repaired or replaced.

In accordance with 10 CFR 50.55a(a)(3)(i), the licensee requested relief from Paragraph ISTC-3630(f) requirements in order to conduct an evaluation in addition to performing the repair or replacement activities as corrective actions. Specifically, the proposed evaluation would demonstrate that the overall leakage rate to the RWST would be maintained below the overall allowable RWST leakage rate even if one of the RWST isolation valves in question exceeds its permissible leakage rate throughout a subsequent 24-month interval. As a result of this evaluation, the licensee proposed that repair or replacement activities could be delayed for an individual RWST isolation valve that exceeds its permissible leakage rates because of the ability of the group of RWST isolation valves to maintain the overall leakage to the RWST below the overall allowable leakage rate. The licensee stated that this proposed alternative would provide adequate indication of valve performance and would continue to provide an acceptable level of quality and safety.

The NRC staff has reviewed the licensee's request for relief and has concluded that the failure of any valve to meet ASME OM Code acceptance criteria indicates that the valve is degraded and may not be capable of performing its safety function. However, the NRC staff notes that the leakage rate limits for the individual RWST isolation valves are derived. The only leakage limit sensitive to RWST isolation valves is the overall leakage limit to the RWST. Therefore, exceeding individual valve leakage rate limits does not necessarily indicate that the group of RWST isolation valves cannot meet their leaktight safety function unless the leakage limit to the RWST is exceeded throughout the subsequent 2-year interval. Thus, applying the analysis of leakage rates and corrective action requirements of Paragraph ISTC-3630(f) in this situation may not be appropriate because the group of RWST isolation valves may be able to meet the leaktight safety function.

However, the NRC staff concludes that if one of the RWST isolation valves in question exceeds its leakage rate limit, then it indicates that the valve has not seated tightly and that significant valve degradation problems could result due to a failure of it not going 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 that 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-3630, but also not meeting the valve-exercising requirements of section ISTC-3500.

The licensee addressed the above concerns in its response to the NRC staff dated December 17, 2003. The licensee's request for additional information (RAI) response included a 10-year leakage history for each of the RWST isolation valves in question and a detailed description of how the proposed alternative can neglect an individual RWST isolation valve's leakage rate as long as the allowable RWST system leakage is not exceeded. Also, in the licensee's RAI response, an RWST system leakage of 16.67 ml/min was evaluated against the Surry LOCA dose analysis. The leakage rate of 16.67 ml/min was based on the assumption that all of the valves in the identified RWST flow paths were leaking at 10 times their designed leak rates (where the design leak rates are the Westinghouse Engineering leak rate specifications for a new valve based on valve type and size). When evaluated against the LOCA dose analysis, it was concluded that the leakage rate of 16.67 ml/min could be considered negligible and would not increase the dose consequences. It was also concluded that the allowable leakage could be increased to 320 ml/min and remain within the LOCA dose results. The licensee further submitted an analysis concluding that system leakage rates of up to 100 ml/min could be acceptable even if all possible iodine from leakage became airborne and was freely released to the atmosphere.

The licensee's proposed evaluation concluded that due to conservatism the potential leakage back to the RWST is negligible, the LOCA dose analysis would be maintained for a leakage rate to the RWST of up to 320 ml/min, and that allowable leakages of up to 100 ml/min could be sustained in order to have acceptable, non-filtered releases of airborne iodine to the atmosphere. Upon review of the licensee's submittal dated June 25, 2003, as supplemented by letter dated December 17, 2003, the NRC staff finds that the licensee's allowable RWST system leakage limits for each situation are conservative and provide an acceptable level of quality and safety. Based upon this information, the NRC staff finds that the licensee's proposed alternative provides reasonable assurance that the leakage rate to the RWST will be maintained below the overall allowable RWST leakage rate even if one of the individual RWST isolation valves in question exceeds its permissible leakage rate throughout a subsequent 24-month interval.

Therefore, the NRC staff concludes that the licensee's proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the fourth 10-year IST interval at Surry, Unit 1. The licensee's proposed alternative provides an acceptable level of quality and safety and an adequate indication of valve performance. 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 through the subsequent 24-month interval. This alternative is authorized only for the valves in question, 1-CH-MOV-1115B, 1-CH-MOV-1115D, 1-SI-25, and 1-SI-MOV-1885A, B, C, and D, and should not be used for 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 the overall leakage to the RWST limit discussed above.

3.12 Surry, Unit 1, Relief Request V-3

The licensee has requested relief from ISTC-3522(b), ISTC-3522(c), and ISTC-5221(c)(3). ISTC-3522(b) states that, "If exercising is not practicable during operation at power, it shall be performed during cold shutdowns." ISTC-3522(c) states that, "If exercising is not practicable during operation at power and cold shutdowns, it shall be performed during refueling outages." ISTC-5221(c)(3) states that, "At least one valve from each group shall be disassembled and

examined at each refueling outage; all valves in each group shall be disassembled and examined at least once every 8 years." ISTC-5221(c)(3) also requires that the disassembly and examination be performed during the refueling outage.

3.12.1 Component Identification

The components affected by this relief request are Service Water to Control Room Condenser and Chilled Water System Discharge Check Valves 1-SW-773, 1-SW-778, 1-SW-839, 1-SW-840, and 1-VS-672. The valves are Class 3, Category C valves.

3.12.2 Licensee's Introduction

As explained below, it is impractical to test check valves 1-SW-839 and 840 to the open position, and check valves 1-SW-773 and 778, and check valve 1-VS-672 to the close position every three months. While it is impractical to test every three months, the open and close positions can be verified while the plant is at power operation. The Code allows tests that are impractical to be performed every three months during power operation, to be performed during cold shutdown (ISTC-3522(b)) or reactor refueling (ISTC-3522(C)). In the case of disassembly, the Code allows disassembly to be performed during the refueling outage (ISTC-5221(c)(3)). The purpose of this relief request is to allow the testing and disassembly to be performed on a reactor refueling frequency, but not during the refueling outage.

3.12.3 Licensee's Background

The main control room and emergency switchgear rooms (MC/ESGR) system provides cooling for the main control room, the emergency switchgear rooms and the relay rooms. The MC/ESGR system is a common system for Unit 1 and Unit 2. The system consists of five trains of chillers (1-VS-E-4A, B, C, D and E) that provide chilled water to the air conditioning units located in the various rooms within the MC/ESGR envelope. The chiller units receive condenser water from the service water system. Surry Power Station originally had three chillers (1-VS-E-4A, B and C). Two more chillers (1-VS-E-4D and E) were added in 1994.

The design of the system calls for two chillers to be operating and two chillers to be available as backup when either unit is operating. The design allows for one chiller to be out of service for maintenance.

Check valves 1-SW-839 and 1-SW-773 are on the discharge piping of the condenser water pump (1-VS-P-1D) that services chiller 1-VS-E-4D, and check valves 1-SW-840 and 1-SW-778 are on the discharge piping of the condenser water pump (1-VS-P-1E) that services chiller 1-VS-E-4E. Check valve 1-VS-672 is on a chiller water discharge header that is common to chillers 1-VS-E-4D and E.

3.12.4 Licensee's Basis for Requesting Relief from ISTC-3522(b) and (c) for 1-SW-773, 1-SW-778, and 1-VS-672

ISTC-3510 requires in part that check valves shall be exercised nominally every three months, except as provided by ISTC-3520. ISTC-3522(b) and (c) which allow for testing

at cold shutdown or reactor refueling if testing at power every three months is impractical. The discharge check valves 1-SW-773 and 778 are within the recirculation loops for the condenser water pumps 1-VS-P-1D and E. These valves can be full flow tested every three months. However, to test these valves to the close position requires that one train of the condenser water system be taken out of service and isolated, the downstream piping pressurized with an external source of water, the upstream piping drained, and leakage collected and measured at an upstream drain. It is estimated that it will take one crew 12 hours to setup and perform the back pressure leak test for each valve. Therefore, it is not practical to perform the close test every three months.

Check valve 1-VS-672 is on a chiller water discharge header that is common to chillers 1-VS-E-4D and E. To test this valve to the close position requires that both trains of the chilled water system be taken out of service and isolated, the downstream piping pressurized with an external source of water, the upstream piping drained, and leakage collected and measured at an upstream drain. Assuming that the D and E chilled water trains have been removed from service to test 1-SW-773 and 778, it is estimated that it will take one crew 8 hours to setup and perform the back pressure leak test for valve 1-VS-672.

The conclusion that the back pressure leak test is not practical for quarterly performance is consistent with NRC guidance in NUREG-1482 that pertains to similar leak testing of check valves tested in the Appendix J. NUREG-1482, Section 4.1.4 states in part that, "If no other practical means is available, it is acceptable to verify that check valves are capable of closing by performing leak-rate testing, such as local leak rate testing in accord with Appendix J to 10 CFR Part 50, at each reactor refueling outage. Recognizing that the setup and performance limitations may render leak testing impractical during power operation and cold shutdown outages, the staff has determined that implementation of an extension of the test frequency for such valves is acceptable in accord with 10 CFR 50.55a(f)(4)(iv)." Section 4.1.4 goes on to state that, "In the justification for the Code cold shutdown outage or refueling outage frequency, the basis for the impracticality of performing testing during power operation and, if applicable, during cold shutdown outages, must be described. The NRC has determined that the need to set up test equipment is adequate justification to defer back flow testing of a check valve until a refueling outage."

ISTC-3522(b) and (c) allow the test interval be deferred to cold shutdown or reactor refueling if testing at power every three months is impractical. Although the back pressure tests are labor intensive and time consuming to the point of being impractical for quarterly performance, they can be performed while the plant is at power. The best time to perform the back pressure tests is when chiller 1-VS-E-4D or E is taken out of service for maintenance. In the case of back pressure testing valve 1-VS-672, both chillers 1-VS-E-4D and E would be out of service which enters both units into a limiting condition of operation per Technical Specification 3.23.C.1.b.

As described above, the control room ventilation system is built with enough redundancy to allow for any chiller train to be removed from service during any operating mode. From a work planning standpoint, the worst time to schedule the removal of a chiller train from service for the purpose of valve testing is during a refueling outage. Most major work activities can only be performed during the refueling outage. These activities are

carefully planned to maximize the availability of safety related equipment and to preserve plant safety margin. Performing work during the refueling outage that could be performed during normal operation unnecessarily complicates the outage planning process and may result in a reduced margin of plant safety.

3.12.5 Licensee's Justification for Disassembly and Examination for 1-SW-839 and 840

The discharge check valves 1-SW-839 and 840 are downstream from the recirculation loops for two of the five trains in the control room condenser water system. These two trains were added to the control room air conditioning system in 1994 and were designed to operate with a service water temperature of 95°F. These two trains have such a large cooling capacity that one of the two trains can absorb the heating load of the entire control room air conditioning system. To maintain a high service water temperature, these trains must be operated with most of the service water flow diverted to the recirculation lines.

To achieve full design flow through the check valve, one train would have to be isolated and the flow of the other train diverted to the discharge check valve. If the flow was diverted to the discharge check valve, the service water temperature would drop and the condenser system would trip off line on low condenser suction pressure. Thus both trains would be out of service. Also, the control room air conditioning system heat load balance would be upset.

The Surry control room is common to both units. One of the two additional trains must be available for service while either Unit 1 or Unit 2 is operable. Therefore, performing the full flow test is not practical when either unit is operating. As an alternate test, these valves will be disassembled and examined.

3.12.6 Licensee's Basis for Relief from ISTC-5221(c)(3) for 1-SW-839 and 840

The best time to disassemble these check valves is while the plant is operating and when chillers 1-VS-E-4D and E are taken out of service for maintenance. As described above, the worst time to schedule the removal of a chiller train from service for the purpose of valve testing is during a refueling outage. Disassembling the valves on a reactor refueling frequency but not necessarily during refueling outages meets the intent of ISTC-5221(c)(3), and does not compromise plant safety during the refueling outage.

3.12.7 Proposed Alternate Testing

The licensee proposes to verify the open positions of check valves 1-SW-773 and 778 every 3 months, and to verify the close positions by performing a back-pressure leak test on a reactor refueling frequency, nominally once every 18 months but no greater than once every 24 months. The close test will be performed while the plant is at power instead of during cold shutdowns or reactor refuelings as required by ISTC-3522(b) and (c).

The licensee proposes to verify the open position of check valve 1-VS-672 with flow every 3 months and to verify the close position by performing a back-pressure leak test on a reactor refueling frequency, nominally once every 18 months but no greater than once every 24 months.

The close test will be performed while the plant is at power instead of during cold shutdowns or reactor refuelings as required by ISTC-3522(b) and (c).

The licensee proposes to verify the open and close positions for check valves 1-SW-839 and 840 by disassembly and examination per the requirements of ISTC-5221(c) except that instead of performing the disassembly and examination during the refueling outage as required by ISTC-5221(c)(3), the disassembly and examination will be performed on a reactor refueling frequency, nominally once every 18 months but no greater than once every 24 months.

3.12.8 Staff Evaluation

The exercising of Category C check valves shall be conducted in accordance with Subsections ISTC-3510, ISTC-3522, and ISTC-5221 of the 1998 Edition of the ASME OM Code, up to and including the 2000 Addenda. ISTC-3510 requires that active Category C check valves be exercised nominally every 3 months in a manner that verifies obturator travels to the closed, full-open, or partially open position as required to fulfill its function. If exercising is not practicable during plant operation or cold shutdowns, ISTC-3522(c) permits the check valves to be full-stroke exercised during each plant's refueling outage.

The NRC staff has reviewed the licensee's basis and logic regarding the practicality of performing a back-pressure leak test for valves 1-SW-773, 1-SW-778, and 1-VS-672. The NRC staff concurs with the conclusion that quarterly back-pressure testing is not practical. This position is consistent with the NRC guidance in NUREG-1482 that pertains to similar leak testing of check valves tested in the Appendix J. NUREG-1482, Section 4.1.4 states in part that, "If no other practical means is available, it is acceptable to verify that check valves are capable of closing by performing leak-rate testing, such as local leak rate testing in accordance with Appendix J to 10 CFR Part 50, at each reactor refueling outage. Recognizing that the setup and performance limitations may render leak testing impractical during power operation and cold shutdown outages, the NRC staff has determined that implementation of an extension of the test frequency for such valves is acceptable in accord with 10 CFR 50.55a(f)(4)(iv)." Section 4.1.4 goes on to state that, "In the justification for the Code cold shutdown outage or refueling outage frequency, the basis for the impracticality of performing testing during power operation and, if applicable, during cold shutdown outages, must be described. The NRC staff has determined that the need to set up test equipment is adequate justification to defer back flow testing of a check valve until a refueling outage."

The licensee stated that testing of 1-SW-773, 1-SW-778, and 1-VS-672 could not be performed during refueling outages because during the outage there are several major activities that would make it impractical to reconfigure the system and test the valves. The licensee has proposed to perform the disassembly and test on a reactor refueling frequency, nominally once every 18 months but no greater than once every 24 months. All other examination requirements of ISTC-5221 still apply.

The NRC staff has reviewed the licensee's proposed alternative and recognizes that there is a trade-off, from a risk perspective, between when a valve system can and cannot be reconfigured and tested. The NRC staff also recognizes that the ability to reconfigure and examine valves at power (when it could be needed to mitigate the consequences of a LOCA), during cold shutdown, or during an outage is significantly impacted by considerations such as the scope of the work on the system, the individual valves that are to be tested, the scheduling

of work windows in the planning process, the system availability requirements, the personnel resources, and the maintenance of an acceptable risk profile. Thus, prior to performing system reconfiguration and valve examination, the effect on risk must be evaluated in accordance with the requirements of 10 CFR 50.65(a)(4). Section 50.65(a)(4) of 10 CFR states, in part, “Before performing maintenance activities (including but not limited to surveillance, post-maintenance testing, and corrective and preventive maintenance), the licensee shall assess and manage the increase in risk that may result from the proposed maintenance activities.”

The NRC staff has further examined the impact on reconfiguring the system and testing the applicable valves 1-SW-773, 1-SW-778, and 1-VS-672 on a reactor refueling frequency and has determined that this proposed alternative maintains the time period between tests to a frequency equivalent to that of a refueling outage frequency. Thus, there is no change in the number of tests performed on the check valves over the life of the component. Testing the valves on a reactor refueling frequency but not necessarily during refueling outages, therefore, meets the intent of the ISTC-5221(c)(3) requirements. The licensee’s proposed alternative will provide adequate indication of valve performance and will continue to provide an acceptable level of quality and safety.

Therefore, the NRC staff has determined that if the licensee evaluates the effect on risk before performing system reconfiguration and valve examination as required in 10 CFR 50.65(a)(4) and performs all of the other requirements of ISTC-5221(c), the examination of check valves 1-SW-773, 1-SW-778, and 1-VS-672 may be performed on a reactor refueling frequency (nominally once every 18 months but no greater than once every 24 months). This action will provide an adequate indication of valve performance and will continue to provide an acceptable level of quality and safety. Thus, the NRC staff authorizes the licensee’s proposed alternative pursuant to 10 CFR 50.55a(a)(3)(i) for the fourth 10-year IST interval.

With regard to check valves 1-SW-839 and 1-SW-840, the licensee proposes to verify the open and close positions for check valves 1-SW-839 and 840 by disassembly and examination per the requirements of ISTC-5221(c) except that instead of performing the disassembly and examination during the refueling outage as required by ISTC-5221(c)(3), the disassembly and examination will be performed on a reactor refueling frequency, nominally once every 18 months but no greater than once every 24 months. The most common method to full-stroke exercise a check valve open is to pass the maximum required accident flow through the valve. However, for some check valves, licensees cannot practically establish or verify sufficient flow to full-stroke exercise the valves open. In many cases, establishing design or accident flow through these valves for testing could result in damage to major plant equipment. Under such conditions, valve disassembly and inspection may be used as “other positive means” of determining if a valve’s disk will full-stroke exercise open and if it has adequate seating capability.

Additional guidance for the full-flow testing and examination of check valves is provided in GL 89-04, Position 2. GL 89-04, Position 2, provides guidelines on developing a sample disassembly and inspection program when a licensee determines that it is burdensome to disassemble and inspect all applicable valves each refueling outage. This guideline, as with the ISTC-5221(c)(3) requirements, limits disassembly and inspection of check valves to refueling outages only.

As an alternative to exercising check valves during plant operation or cold shutdowns, ISTC-5221(c)(3) permits check valves to be disassembled and inspected every refueling outage to verify operability. However, in accordance with 10 CFR 50.55a(a)(3)(i), the licensee proposed an alternative to the ISTC-5221(c)(3) requirements. The licensee stated that disassembly and examination of 1-SW-839 and 1-SW-840 could not be performed during refueling outages because during the outage there are several major work and test activities that would make it impractical to disassemble and examine the valves. The licensee has proposed to perform the disassembly and examination on a reactor refueling frequency, nominally once every 18 months but no greater than once every 24 months. The licensee further stated that all other disassembly and examination requirements of ISTC-5221(c) still apply.

The NRC staff has reviewed the licensee's proposed alternative and recognizes that there is a trade-off, from a risk perspective, between when a valve can and cannot be disassembled and examined. The NRC staff also recognizes that the ability to disassemble and examine valves at power (when it could be needed to mitigate the consequences of a LOCA), during cold shutdown, or during an outage is significantly impacted by considerations such as the scope of the work on the system, the individual valves that are to be tested, the scheduling of work windows in the planning process, the system availability requirements, personnel resources, and the maintenance of an acceptable risk profile. Thus, prior to performing disassembly and examination, the effect on risk must be evaluated in accordance with the requirements of 10 CFR 50.65(a)(4). Section 50.65(a)(4) of 10 CFR states, in part, "Before performing maintenance activities (including but not limited to surveillance, post-maintenance testing, and corrective and preventive maintenance), the licensee shall assess and manage the increase in risk that may result from the proposed maintenance activities."

The NRC staff has further examined the impact on disassembling the applicable valves, 1-SW-839 and 1-SW-840, on a reactor refueling frequency and has determined that this proposed alternative maintains the time period between tests to a frequency equivalent to that of a refueling outage frequency. Thus, there is no change in the number of tests performed on the check valves over the life of the component. Disassembling the valve on a reactor refueling frequency but not necessarily during refueling outages, therefore, meets the intent of the ISTC-5221(c)(3) requirements. The licensee's proposed alternative will provide adequate indication of valve performance and will continue to provide an acceptable level of quality and safety.

Therefore, the NRC staff has determined that if the licensee evaluates the effect on risk before performing disassembly and examination as required in 10 CFR 50.65(a)(4) and performs all of the other requirements of ISTC-5221(c), the disassembly and examination of check valves 1-SW-839 and 1-SW-840 may be performed on a reactor refueling frequency (nominally once every 18 months but no greater than once every 24 months). This action will provide an adequate indication of valve performance and will continue to provide an acceptable level of quality and safety. Thus, the NRC staff authorizes the licensee's proposed alternative pursuant to 10 CFR 50.55a(a)(3)(i) for the fourth 10-year IST interval.

3.13 Surry, Unit 1, Relief Request V-4

The licensee has requested relief from ISTC-5221(c)(3). ISTC-5221(c)(3) states that at least one valve from each group shall be disassembled and examined at each refueling outage; all valves in each group shall be disassembled and examined at least once every 8 years.

3.13.1 Component Identification

The component affected by this relief request is RWST Cooling System Isolation Check Valve 1-CS-45, which is a Class 2, Category C valve.

3.13.2 Licensee's Justification for Disassembly and Examination Test Frequency

This two inch check valve is on the refueling water refrigeration discharge piping that returns to the refueling water storage tank (RWST). To test the valve for closure, the cooling flow through the refrigeration units must be stopped, the valve isolated and the cooling system boundary breached. Restoring the RWST cooling system to operation after the system has been exposed to the atmosphere requires a lengthy venting process. During most of the year, the RWST cooling system runs continuously to maintain the RWST water temperature below 45^0 F per Technical Specification Section 3.4.A.3. Therefore, it is not practical to perform a quarterly closure test.

The valve is located about ten feet above the ground near the RWST and is very accessible. There are no vents or drains downstream of the valve. The upstream refrigeration units do have drains on the heat exchangers. However, [the] RWST head would have to be used to supply the differential pressure across the check valve. This test configuration could provide a drainage path for the RWST if the check valve failed open and [challenged] the integrity of the RWST system. Considering the size of the valve (2"), [its] accessibility and the problem of using RWST to perform a back pressure test, Surry Power Station has determined that the best method for verifying closure is to disassemble and examine the valve.

3.13.4 Licensee's Basis for Relief (ISTC-5221(c)(3))

The disassembly and examination could be performed during refueling outages or while the plant is operating during cool weather when the need for RWST cooling is minimal. However, during the outage the RWST is involved in several major work and test activities [that] would be complicated by the disassembly and examination. For example, during the refueling operation water is pumped from the RWST to the reactor cavity via the low head safety injection (LHSI) pumps. The process is reversed when the new fuel is in place. Also, the RWST is used during the comprehensive pump tests for the LHSI pumps, the inside recirculation spray pumps, and the containment spray pumps. The RWST cooling system should be operable to support these work and test activities. Performing work during the refueling outage that could be performed during normal operation unnecessarily complicates the outage planning process and may result in a reduced margin of plant safety. Disassembling the valve on a reactor refueling frequency but not necessarily during refueling outages meets the intent of ISTC-5221(c)(3), and does not compromise plant safety during the refueling outage.

3.13.5 Proposed Alternative Testing

The licensee proposes to verify the close position by disassembly and examination per the requirements of ISTC-5221(c) except that instead of performing the disassembly and examination during the refueling outage as required by ISTC-5221(c)(3), the disassembly and examination would be performed on a reactor refueling frequency, nominally once every 18 months but no greater than once every 24 months. Normal operation of the RWST cooling system will verify that the valve opens.

3.13.6 Staff Evaluation

The exercising of Category C check valves shall be conducted in accordance with Subsections ISTC-3510, ISTC-3522, and ISTC-5221 of the 1998 Edition of the ASME OM Code, up to and including the 2000 Addenda. ISTC-3510 requires that active Category C check valves be exercised nominally every 3 months in a manner that verifies obturator travels to the closed, full-open, or partially open position as required to fulfill its function. If exercising is not practicable during plant operation or cold shutdowns, ISTC-3522(c) permits the check valves to be full-stroke exercised during each plant's refueling outage. The most common method to full-stroke exercise a check valve open is to pass the maximum required accident flow through the valve. However, for some check valves, licensees cannot practically establish or verify sufficient flow to full-stroke exercise the valves open. In many cases, establishing design or accident flow through these valves for testing could result in damage to major plant equipment. Under such conditions, valve disassembly and inspection may be used as "other positive means" of determining if a valve's disk will full-stroke exercise open and if it has adequate seating capability.

Additional guidance for the full-flow testing and examination of check valves is provided in GL 89-04, Position 2. GL 89-04, Position 2, provides guidelines for developing a sample disassembly and inspection program when a licensee determines that it is burdensome to disassemble and inspect all applicable valves each refueling outage. The program involves grouping similar valves and testing a least one valve in each group during each refueling outage. A different valve in each group is required to be disassembled, inspected, and manually full-stroke exercised at each successive refueling outage until the entire group has been tested. This guideline, as with the ISTC-5221(c)(3) requirements, limits disassembly and inspection of check valves to refueling outages only.

As an alternative to exercising check valves during plant operation or cold shutdowns, ISTC-5221(c)(3) permits check valves to be disassembled and inspected every refueling outage to verify operability. However, in accordance with 10 CFR 50.55a(a)(3)(i), the licensee proposed an alternative to the ISTC-5221(c)(3) requirements. The licensee stated that disassembly and examination of valve 1-CS-45 could not be performed during refueling outages because during the outage there are several major activities that rely on the RWST that would make it impractical to disassemble and examine the valve. The licensee has proposed to perform the disassembly and examination of this check valve on a reactor refueling frequency, nominally once every 18 months but no greater than once every 24 months. The licensee further stated that all other disassembly and examination requirements of ISTC-5221(c) still apply.

The NRC staff has reviewed the licensee's proposed alternative and recognizes that there is a trade-off, from a risk perspective, between when a valve can and cannot be disassembled and examined. The NRC staff also recognizes that the ability to disassemble and examine valves at power (when it could be needed to mitigate the consequences of a LOCA), during cold shutdown, or during an outage is significantly impacted by considerations such as the scope of the work on the system, the individual valves that are to be tested, the scheduling of work windows in the planning process, the system availability requirements, the personnel resources, and the maintenance of an acceptable risk profile. Thus, prior to performing disassembly and examination, the effect on risk must be evaluated in accordance with the requirements of 10 CFR 50.65(a)(4). Section 50.65(a)(4) of 10 CFR states, in part, "Before performing maintenance activities (including but not limited to surveillance, post-maintenance testing, and corrective and preventive maintenance), the licensee shall assess and manage the increase in risk that may result from the proposed maintenance activities."

The NRC staff has further examined the impact on disassembling valve 1-CS-45 on a reactor refueling frequency and has determined that this proposed alternative maintains the time period between tests to a frequency equivalent to that of a refueling outage frequency. Thus, there is no change in the number of tests performed on the check valves over the life of the component. Disassembling the valve on a reactor refueling frequency but not necessarily during refueling outages, therefore, meets the intent of the ISTC-5221(c)(3) requirements. The licensee's proposed alternative will provide adequate indication of valve performance and will continue to provide an acceptable level of quality and safety.

Therefore, the NRC staff has determined that if the licensee evaluates the effect on risk before performing disassembly and examination as required in 10 CFR 50.65(a)(4) and performs all of the other requirements of ISTC-5221(c), then the disassembly and examination of the check valve may be performed on a reactor refueling frequency (nominally once every 18 months but no greater than once every 24 months). This action will provide an adequate indication of valve performance and will continue to provide an acceptable level of quality and safety. Thus, the NRC staff authorizes the licensee's proposed alternative pursuant to 10 CFR 50.55a(a)(3)(i) for the fourth 10-year IST interval.

3.14 Surry, Unit 1, Relief Request V-5

The licensee has requested relief from ISTC-3522(b) and ISTC-3522(c). ISTC-3522(b) states that, "If exercising is not practicable during operation at power, it shall be performed during cold shutdowns." ISTC-3522(c) states that, "If exercising is not practicable during operation at power and cold shutdowns, it shall be performed during refueling outages."

3.14.1 Component Identification

The components affected by this relief request are Emergency and Manual Emergency Boration Line Isolation Check Valves 1-CH-225, 1-CH-227, and 1-CH-229. The valves are Class 2, Category C valves.

3.14.2 Licensee's Basis for Requesting Relief

In its request, the licensee stated that due to the current piping configuration, the check valves cannot be back-seat tested with flow. Since the valve bonnets are seal-welded, the seal weld

must be cut before the valve can be disassembled. Also, the system contains a 7-percent boric acid solution. For these reasons, the licensee indicated that disassembly is not the preferred method to verify the close position. As such, the licensee has proposed that the valves be radiographed to verify that the disks are on the seat. However, since radiography creates a potential personnel hazard due to the use of a radioactive source, the licensee is proposing to perform the radiographs infrequently.

3.14.3 Proposed Alternative Testing Frequency

The licensee has proposed to radiograph the subject valves on a reactor refueling frequency, nominally once every 18 months but no greater than once every 24 months, instead of during cold shutdowns or reactor refueling as required by ISTC-3522(b) and (c).

Check valves 1-CH-225, 227, and 229 will also be full-stroked exercised every quarter during normal operation when the reactor coolant boric acid concentration is above 100 ppm. Valves 1-CH-227 and 229 are of the same manufacturer and model number and are subject to similar service conditions. Valve 1-CH-227 is a 2-inch valve and valve 1-CH-229 is a 1-inch valve. Therefore, these valves will be grouped together. To verify the closed position, one valve will be radiographed each test interval. This sampling plan will follow the guidance described in NUREG-1482, Section 4.1.2. Valve 1-CH-225 is of a different manufacturer and will be radiographed every test interval to verify the closed position. The closed test will be performed while the plant is at power on a reactor refueling frequency, nominally once every 18 months but no greater than once every 24 months.

3.14.4 Staff Evaluation

The exercising of Category C check valves shall be conducted in accordance with Subsections ISTC-3510, ISTC-3522, and ISTC-5221 of the 1998 Edition of the ASME OM Code, up to and including the 2000 Addenda. ISTC-3510 requires that active Category C check valves be exercised nominally every 3 months in a manner that verifies obturator travels to the closed, full-open, or partially open position as required to fulfill its function. If exercising is not practicable during plant operation, ISTC-3522(b) permits valves to be full-stroke exercised during cold shutdowns. Additionally, if exercising is not practicable during plant operation or cold shutdowns, ISTC-3522(c) permits valves to be full-stroke exercised during each plant's refueling outage. The most common method to full-stroke exercise a check valve open is to pass the maximum required accident flow through the valve. However, for some check valves, licensees cannot practically establish or verify sufficient flow to full-stroke exercise the valves open. In many cases, establishing design or accident flow through these valves for testing could result in damage to major plant equipment. Under such conditions, the Code allows the use of nonintrusive techniques that utilize indirect evidence or "other positive means" to verify the full stroke of check valves.

The Code allows the use of indirect evidence (such as changes in system pressure, flow, temperature, or level) or "other positive means" in accordance with ISTC-5221(a)(3) to verify the ability of the check valves to be full stroked or adequately seated. When nonintrusive testing techniques are used in a sampling plan, licensees may implement a program such that similar valves in the same service are grouped for testing purposes (not to exceed four valves in a single group). Additionally, nonintrusive testing by "other positive means" must be repeatable in order to meet the intent of the Code.

The licensee has proposed to use radiography to verify that check valves 1-CH-225, 1-CH-227, and 1-CH-229 have seated properly. Also, in accordance with 10 CFR 50.55a(a)(3)(i), the licensee has proposed an alternative testing frequency to the requirements of ISTC-3522(b) and ISTC-3522(c). The licensee stated that the best time to perform the radiographs would be during normal plant operation when work activities and the number of workers are at a minimum. As such, the licensee proposed to perform the radiographs on a reactor refueling frequency (nominally once every 18 months but no greater than once every 24 months) in order to minimize the number of times the test personnel are exposed to the hazard of the radioactive source.

Further, the licensee proposed that the check valves in question will be full-stroke exercised every quarter during normal operation (reactor coolant boric acid concentration above 100 ppm) and that the guidance described in NUREG-1482, Section 4.1.2, Rev 0, regarding the use of a sampling plan would be met. Valves 1-CH-227 and 1-CH-299 will be grouped together and one valve will be radiographed each test interval to verify the close position. Valve 1-CH-225 is, however, of a different manufacturer and will radiographed every test interval to verify the close position.

The NRC staff has reviewed the licensee's proposed alternative and notes that nonintrusive techniques have been shown to be effective in verifying a full-stroke exercise of check valves by industry group testing programs and by onsite testing at commercial nuclear facilities. Various nonintrusive techniques or combinations of different techniques have also been shown to be capable of detecting degradation of check valves during testing programs and onsite testing. If performed in accordance with quality assurance program requirements, the licensee's proposed radiography testing technique is considered "other positive means" in accordance with ISTC-5221(a)(3), and relief is not required for its use except as necessary for the testing frequency alternative.

Thus, because an alternative testing frequency is requested by the licensee, relief is needed to conduct the radiography testing on the proposed reactor refueling frequency (nominally once every 18 months but no greater than once every 24 months). The NRC staff recognizes that there is a trade-off, from a risk perspective, between when and how often radiography can be used to verify that the disks are on their seats. During radiography, valves are radiographed with a radioactive source that can create a potential personnel hazard. The NRC staff notes that to reduce the number of times that test personnel are exposed to this hazard, the radiographs should be performed infrequently, and the effect on risk associated with performing any radiography must be evaluated in accordance with the requirements of 10 CFR 50.65(a)(4). Section 50.65(a)(4) of 10 CFR states, in part, "Before performing maintenance activities (including but not limited to surveillance, post-maintenance testing, and corrective and preventive maintenance), the licensee shall assess and manage the increase in risk that may result from the proposed maintenance activities."

The NRC staff has further examined the impact on verifying the close position of valves 1-CH-225, 1-CH-227, and 1-CH-229 on a reactor refueling frequency and has determined that this proposed alternative maintains the time period between tests to a frequency equivalent to that of a refueling outage frequency. Thus, there is no change in the number of tests performed on the check valves over the life of the component. Testing the valves using radiography on a reactor refueling frequency but not necessarily during refueling outages meets the intent of the ISTC-3522(b) and (c) requirements. The licensee's proposed alternative will

provide adequate indication of valve performance and will continue to provide an acceptable level of quality and safety.

Therefore, the NRC staff has determined that if the licensee evaluates the effect on risk before performing the radiography testing as required in 10 CFR 50.65(a)(4) and follows the guidance in NUREG-1482, radiographs may be performed to verify the close position of the 1-CH-225, 1-CH-227, and 1-CH-229 check valves during normal plant operation on a reactor refueling frequency (nominally once every 18 months but no greater than once every 24 months). The licensee shall also full-stroke exercise the applicable check valves every quarter during normal operation (when reactor coolant boric acid concentration is above 100 ppm). These actions will provide an adequate indication of valve performance and will continue to provide an acceptable level of quality and safety. Thus, the NRC staff authorizes the licensee's proposed alternative pursuant to 10 CFR 50.55a(a)(3)(i) for the fourth 10-year IST interval.

3.15 Surry, Unit 1, Relief Request V-6

The licensee has requested relief from ISTC-3522(b) and ISTC-3522(c). ISTC-3522(b) states that, "If exercising is not practicable during operation at power, it shall be performed during cold shutdowns." ISTC-3522(c) states that, "If exercising is not practicable during operation at power and cold shutdowns, it shall be performed during refueling outages."

3.15.1 Component Identification

The component affected by this relief request is the Charging Pump Seal Cooling Surge Tank Makeup Valve 1-CC-805, which is a Class 3, Category C valve.

3.15.2 Licensee's Basis for Requesting Relief

> With the current piping configuration, the check valve cannot be back pressure tested with flow. There is no isolation valve upstream so a freeze seal is necessary to isolate the valve for disassembly. The preferred examination method is to radiograph the valve to verify that the disk is on the seat. Radiography creates a potential personnel hazard due to the use of a radioactive source. To reduce the number of times that test personnel are exposed to this hazard, the radiographs should be performed infrequently. Also, setup of the radioactive source, securing the area and performing the radiograph is a time consuming process that is impractical to perform every three months.
>
> This valve is located in the auxiliary building basement at elevation 2. Performing a radiograph requires that the surrounding area be cordoned off approximately two hours before the exposure, the area cleared of personnel, and access denied to personnel before and during the period of the exposure. The area must remain free of personnel from two to four hours depending on the success of the initial exposures. The restricted area includes the auxiliary building basement.
>
> Cold shutdown outages and reactor refueling outages are periods of high work activity. Outage work would be interrupted in a substantial portion of the auxiliary building during the preparation of the radiograph. Also, due to the increased number of workers on site during these outages, there is an increased risk of accidental exposure.

3.15.3 Proposed Alternative Testing

The licensee has proposed to perform the radiographs during normal plant operation, when work activities and the number of workers are at a minimum. To reduce the number of times that test personnel are exposed to the hazard of performing the radiographs, the licensee proposes that the radiographs be performed on a reactor refueling frequency, nominally once every 18 months but no greater than once every 24 months, instead of during cold shutdown outages or reactor refueling outages as required by ISTC-3522(b) and (c).

Makeup Valve 1-CC-805 will be tested to the full-open position every reactor refueling. The close test will be performed while the plant is at power on a reactor refueling frequency, nominally once every 18 months but no greater than once every 24 months.

3.15.4 Staff Evaluation

The exercising of Category C check valves shall be conducted in accordance with Subsections ISTC-3510, ISTC-3522, and ISTC-5221 of the 1998 Edition of the ASME OM Code, up to and including the 2000 Addenda. ISTC-3510 requires that active Category C check valves be exercised nominally every 3 months in a manner that verifies obturator travels to the closed, full-open, or partially open position. If exercising is not practicable during plant operation, ISTC-3522(b) permits valves to be full-stroke exercised during cold shutdowns. Additionally, if exercising is not practicable during plant operation or cold shutdowns, ISTC-3522(c) permits valves to be full-stroke exercised during each plant's refueling outage. The most common method to full-stroke exercise a check valve open is to pass the maximum required accident flow through the valve. However, for some check valves, licensees cannot practically establish or verify sufficient flow to full-stroke exercise the valves open. In many cases, establishing design or accident flow through these valves for testing could result in damage to major plant equipment. Under such conditions, the Code allows the use of nonintrusive techniques that utilize indirect evidence or "other positive means" to verify the full stroke of check valves.

The Code allows the use of indirect evidence (such as changes in system pressure, flow, temperature, or level) or "other positive means" in accordance with ISTC-5221(a)(3) to verify the ability of the check valves to be full stroked or adequately seated. When nonintrusive testing techniques are used in a sampling plan, licensees may implement a program such that similar valves in the same service are grouped for testing purposes (not to exceed four valves in a single group). Additionally, nonintrusive testing by "other positive means" must be repeatable in order to meet the intent of the Code.

The licensee has proposed to use radiography to verify that check valve 1-CC-805 has seated properly. In accordance with 10 CFR 50.55a(a)(3)(i), the licensee has proposed an alternative testing frequency to the requirements of ISTC-3522(b) and ISTC-3522(c). The licensee stated that the best time to perform the radiographs would be during normal plant operation when work activities and the number of workers are at a minimum. As such, the licensee proposed to perform the radiographs on a reactor refueling frequency (nominally once every 18 months but no greater than once every 24 months) in order to minimize the number of times the test personnel are exposed to the hazard of the radioactive source. The licensee further stated that the applicable valve would be tested to the full-open position every reactor refueling.

The NRC staff has reviewed the licensee's proposed alternative and notes that nonintrusive techniques have been shown to be effective in verifying a full-stroke exercise of check valves by industry group testing programs and by onsite testing at commercial nuclear facilities. Various nonintrusive techniques or combinations of different techniques have also been shown to be capable of detecting degradation of check valves during testing programs and onsite testing. If performed in accordance with quality assurance program requirements, the licensee's proposed radiography testing technique is considered "other positive means" in accordance with ISTC-5221(a)(3), and relief is not required for its use except as necessary for the testing frequency alternative.

Thus, because an alternative testing frequency is requested by the licensee, relief is needed to conduct the radiography testing on the proposed reactor refueling frequency (nominally once every 18 months but no greater than once every 24 months). The NRC staff recognizes that there is a trade-off, from a risk perspective, between when and how often radiography can be used to verify that the disks are on their seats. During radiography, valves are radiographed with a radioactive source that can create a potential personnel hazard. The NRC staff notes, therefore, that to reduce the number of times that test personnel are exposed to this hazard, the radiographs should be performed infrequently, and the effect on risk associated with performing any radiography must be evaluated in accordance with the requirements of 10 CFR 50.65(a)(4). Section 50.65(a)(4) of 10 CFR states, in part, "Before performing maintenance activities (including but not limited to surveillance, post-maintenance testing, and corrective and preventive maintenance), the licensee shall assess and manage the increase in risk that may result from the proposed maintenance activities."

The NRC staff has further examined the impact on verifying the close position of valve 1-CC-805 on a reactor refueling frequency and has determined that this proposed alternative maintains the time period between tests to a frequency equivalent to that of a refueling outage frequency. Thus, there is no change in the number of tests performed on the check valve over the life of the component. Testing the valve using radiography on a reactor refueling frequency but not necessarily during refueling outages, therefore, meets the intent of the ISTC-3522(b) and (c) requirements. The licensee's proposed alternative will provide adequate indication of valve performance and will continue to provide an acceptable level of quality and safety.

Therefore, the NRC staff has determined that if the licensee evaluates the effect on risk before performing the radiography testing as required in 10 CFR 50.65(a)(4) and performs all of the other requirements of ISTC-5221, radiography may be performed to verify the close position of the 1-CC-805 check valve while the plant is at power on a reactor refueling frequency (nominally once every 18 months but no greater than once every 24 months). The licensee shall also test the applicable valve to the full-open position every reactor refueling. These actions will provide an adequate indication of valve performance and will continue to provide an acceptable level of quality and safety. Thus, the NRC staff authorizes the licensee's proposed alternative pursuant to 10 CFR 50.55a(a)(3)(i) for the fourth 10-year IST interval.

3.16 Surry, Unit 2, Relief Request P-1

In its submittal, the licensee requested relief from the vibration testing requirements of paragraph ISTB-3300 of the OM Code for the components listed in Table P-1. ISTB-3300 requires that reference values be determined from the results of preservice testing or from the results of the first inservice test.

3.16.1 Component Identification

The components affected by this relief request are as listed in the table below.

Pump Number	System	Code Class	OM Group	Description
1-CC-P-1C 1-CC-P-1D	Component Cooling	3	A	CCW Pump
2-CC-P-2A	Component Cooling	3	A	Charging Pump Cooling Water Pump
2-CH-P-1C	Chemical and Volume Control	2	A	High Head Safety Injection / Charging Pump
1-CH-P-2D	Chemical and Volume Control	2	A	Boric Acid Transfer Pump
2-SW-P-10A 2-SW-P-10B	Service Water	3	A	Charging Pump Service Water Pump

3.16.2 Licensee's Basis for Requesting Relief

The pumps listed in Table P-1 have at least one vibration reference value (Vr) that is currently less than 0.05 inches per second (ips). Small values for Vr produce small acceptable ranges for pump operation. The acceptable ranges are defined in Tables ISTB-5100-1, ISTB-5200-1, ISTB-5300-1 and ISTB-5300-2 as less than or equal to 2.5Vr. Based on a small acceptable range, a smooth running pump could be subject to unnecessary corrective action.

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

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

When new reference values are established per ISTB-3310, ISTB-3320 or ISTB-6200(c), the measured parameters will be evaluated for each location to determine if the provisions of this relief request still apply. If the measured Vr is greater than 0.05 ips, the requirements of ISTB-3300 will be applied even if the pump is listed in Table P-1. Conversely, if the measured Vr is less than 0.05 ips, a minimum value of 0.05 ips will be used for Vr even if the pump is not currently listed in Table P-1.

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

- vibration monitoring and analysis beyond that required by ISTB, and
- oil sampling and analysis where applicable (e.g., for pumps with sufficiently large oil reservoirs).

If the measured parameters are outside the normal operating range or are determined by analysis to be trending toward 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-3300 provides an acceptable level of quality and safety.

3.16.3 Proposed Alternate 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 Surry 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-3300 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 50.55(a)(3)(i) we request relief from the specific ISTB Code requirements identified in this relief request.

3.16.4 Staff Evaluation

Pumps with vibration levels 0.1 ips or less are generally considered “smooth running pumps.” The proposed minimum vibration level is well below this point. In addition, the ISTB Alert Range for pumps that operate with a pump speed greater than 600 rpm is 0.325 to 0.7 ips. Action is required for vibration greater than 0.7 ips. All pumps listed in Table P-1 of the licensee’s submittal operate with pump speeds greater than 600 rpm. It is also noted that for very small reference values, hydraulic noise and instrument error can be a significant portion of the reading and affect the repeatability of subsequent measurements. The use of very small or non-repeatable measurements may result in unneeded test or maintenance. Therefore, the proposal to use 0.05 ips as a starting point in the evaluation of vibration velocity is conservative and appropriate.

However, there may be cases where the proposed minimum may not be appropriate. Therefore, if the licensee chooses to include components other than those listed in Table P-1 of its submittal, an evaluation should be performed, including a reference to manufacturer's recommendation to assure the minimum reference value is appropriate.

On these bases, the NRC staff finds that the licensee's alternative provides adequate indication of pump performance and an acceptable level of quality and safety. This alternative to the requirements of ISTB-3300, Tables ISTB-5100-1, ISTB-5200-1, ISTB-5300-1, and ISTB-5300-2 provides an acceptable level of quality and safety. Therefore, the alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the fourth 10-year IST interval at Surry, Unit 2.

3.17 Surry, Unit 2, Relief Request P-2

The licensee has requested relief from OM Code Table ISTB-3400-1. Table ISTB-3400-1 requires an inservice test be run on each Group A pump nominally every 3 months.

3.17.1 Component Identification

The components affected by this relief request are RHR Pumps 2-RH-P-1A and 2-RH-P-1B. These pumps are classified as Group A pumps in the IST Program and function to remove decay heat from the reactor core and the reactor coolant system during plant cool down.

3.17.2 Licensee's Basis for Requesting Relief

> The residual heat removal pumps are located inside 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). The RHR motor operated suction and discharge isolation valves are interlocked with an output signal from RCS pressure transmitters that prevent the valves from being opened when the RCS pressure exceeds 490 psig. Therefore, testing the residual heat removal pumps during normal operation is not practical.

3.17.3 Proposed Alternate Testing

> These pumps will be tested every cold shutdown. For a cold shutdown or reactor refueling that extends longer than three months, the pumps will be tested every three months in accordance with [ISTB-3400-1]. However, it is not the intent of this relief request to require a testing interval that is less than three months, either for extended outages or back-to-back outages.
>
> Using the provisions of this relief request as an alternative to the specific requirements of Table ISTB-3400-1 identified above[,] that have been determined 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.

3.17.4 Staff Evaluation

RHR pumps 2-RH-P-1A and 2-RH-P-1B are low-pressure (600 psig design pressure) pumps that take suction from the RCS hot leg, pass flow through the residual heat exchangers, and discharge to the RCS cold leg. These pumps are in a standby condition during power operation and only activate when the RCS is at a low pressure and the RHR system is needed. The RHR system is a low-pressure system controlled by two motor-operated valves that are interlocked with RCS pressure transmitters to prevent the valves from being opened whenever the RCS system pressure exceeds 450 psig (Surry UFSAR Section 9.3.3.2). These pumps are classified as Group A pumps in the IST Program.

The ASME OM Code, Table ISTB-3400-1, requires that a Group A test be performed quarterly on each Group A pump. However, in accordance with 10 CFR 50.55a(f)(6)(i), the licensee has requested relief from the above ISTB Code requirements because they have determined that quarterly testing during normal operation is impractical. The licensee has proposed an alternative to the Table ISTB-3400-1 requirements that would allow it to test the Group A pumps during every cold shutdown or refueling outage without performing this test during testing intervals that are less than 3 months.

The NRC staff has reviewed the Table ISTB-3400-1 requirements and has determined that due to the standby condition of the RHR pumps and the isolation of the RHR system during power operation, compliance with the quarterly testing requirements is not practical. Major plant and system modifications would be needed to allow quarterly testing of the RHR pumps in accordance with the Code requirements. These modifications would be costly and burdensome for the licensee.

As an alternative to the Table ISTB-3400-1 requirements, the licensee has proposed to test the RHR 2-RH-P-1A and 2-RH-P-1B pumps every cold shutdown, but no more frequently than once every 3 months. The NRC staff finds that while the licensee's proposal meets the intent of the Table ISTB-3400-1 requirements, additional requirements are needed to ensure that the pumps are performing adequately. Therefore, the licensee shall perform the following actions.
(1) During either refueling outages or cold shutdowns, pumps 2-RH-P-1A and 2-RH-P-1B shall be tested prior to being put into service and declared operable. This test will remain valid for a period of 3 months. (2) During refueling outages or cold shutdowns that extend beyond a 3-month period, the licensee shall test these pumps once every 3 months. (3) During back-to-back refueling outages or cold shutdowns that occur beyond any 3-month test period, the licensee shall test these pumps once every 3 months.

The NRC staff finds that the licensee's alternative testing, in conjunction with the conditions described above, meets the intent of the Code and will ensure that the pumps are able to perform their desired functions. Therefore, in accordance with 10 CFR 50.55a(f)(6)(i) and for the fourth 10-year IST interval, relief is granted from the the requested ASME Code requirements. Additionally, the following conditions are imposed by the NRC staff pursuant to 10 CFR 50.55a(f)(6)(i): (1) During either refueling outages or cold shutdowns, pumps 2-RH-P-1A and 2-RH-P-1B shall be tested prior to being put into service and declared operable. This test will remain valid for a period of 3 months. (2) During refueling outages or cold shutdowns that extend beyond a 3-month period, the licensee shall test these pumps once every 3 months. (3) During back-to-back refueling outages or cold shutdowns that occur beyond any 3-month test period, the licensee shall test these pumps once every 3 months.

3.18 Surry, Unit 2, Relief Request P-3

The licensee has requested relief from ISTB-5121 and ISTB-5123. ISTB-5121 requires that Group A tests be conducted with the pump operating at a specified reference point. ISTB-5123 requires that comprehensive tests be conducted with the pump operating at a specified reference point.

3.18.1 Component Identification

The components affected by this relief request are CCW pumps 1-CC-P-1C and 1-CC-P-1D. These pumps are classified as Group A pumps in the IST Program and function to supply cooling water to transfer heat from heat exchangers containing reactor coolant or other radioactive fluids.

3.18.2 Licensee's Basis for Requesting Relief

> During testing of the component cooling water pumps, flow is adjusted to the reference flow rate using an 18 inch butterfly valve. The butterfly valve is a crude throttling device and does not provide the fine tuning that is required to duplicate the reference flow rate from test to test. Consequently, throttling to the same reference flow rate during each test is not practical.

3.18.3 Proposed Alternate Testing

The licensee proposes to test the CCW pumps in a range of flows and to compare the results to acceptance criteria based on a portion of the pump curve and the hydraulic acceptance criteria given in ISTB. Testing will be in accordance with the guidelines set forth in Code Case OMN-9, "Use of a Pump Curve for Testing."

3.18.4 Staff Evaluation

1-CC-P-1C and 1-CC-P-1D are Group A centrifugal pumps that supply water to the dozens of independent loads provided for by the CCW system. The system's flow is adjusted during tests via the throttling of an 18-inch butterfly valve. Butterfly valves are generally most sensitive in the 15° or 70° open position; however, severe throttling may lead to cavitation. This design limitation makes it difficult to attain a specific reference point.

Sections ISTB-5121 and ISTB-5123 of the ASME OM Code outline the test acceptance criteria for centrifugal pumps. They require that Group A (ISTB-5121) and comprehensive (ISTB-5123) tests to be conducted with the pump operating at a specified reference point. However, in accordance with 10 CFR 50.55a(a)(3)(i), the licensee has requested relief from the above ISTB Code requirements because the butterfly valve used to adjust the flow to the CCW pumps provides only a crude method of controlling test flow, thus preventing the pumps from operating at a specified reference point. The licensee has proposed an alternative to the ISTB-5121 and ISTB-5123 requirements that would enable the CCW pumps to be tested in a range of flows and to compare the results to acceptance criteria based on a portion of the pump curve and the

hydraulic acceptance criteria given in ISTB. The licensee also stated that the guidelines set forth in Code Case OMN-9, “Use of a Pump Curve for Testing,” would be followed.

The NRC staff has reviewed the ISTB-5121 and ISTB-5123 requirements and has verified that it may not be practical to throttle to a specific reference flow with a butterfly valve that is not suited for fine flow control. Therefore, in accordance with RG 1.192, if the adjustment to a specific reference value is not practical when testing a centrifugal pump, licensees may follow the rules outlined in Code Case OMN-9 in lieu of the ISTB-5222 and ISTB-5223 requirements. Code Case OMN-9 states that testing using a reference curve can be acceptable if the following elements are incorporated into the IST program and procedures for developing and implementing the curve(s):

a. Curves are developed, or manufacturer’s pump curves are validated, when the pumps are known to be operating acceptably.

b. The reference points used to develop or validate the curves are measured using instruments at least as accurate as required by the Code.

c. Curves are based on an adequate number of data points, with a minimum of three.

d. Points are beyond the “flat” portion (low rates of the curve in a range which includes or is as close as practicable to design-basis flow rates).

e. Acceptance criteria based on the curves does not conflict with TS or Facility Safety Analysis Report operability criteria for flow rate and differential pressure for the affected pumps.

f. If vibration levels vary significantly over the range of pump conditions, a method for assigning appropriate vibration acceptance criteria should be developed for regions of the pump curve.

g. When the reference curve may have been affected by repair, replacement, or routine service, a new reference curve shall be determined or the previous curve revalidated by an inservice test.

Based on the above information, the NRC staff has determined that the licensee’s proposed alternative meets the intent of the ISTB-5121 and ISTB-5123 requirements and will provide an adequate level of quality and safety when applied during the IST program for the CCW pumps 1-CC-P-1C and 1-CC-P-1D. The CCW 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 the hydraulic acceptance criteria given in ISTB.

The NRC staff has determined that by performing the above requirements the CCW pumps will be able to perform their desired functions and will provide an adequate level of quality and safety. Therefore, in accordance with 10 CFR 50.55a(a)(3)(i), the alternative is authorized for the fourth 10-year IST interval at Surry, Unit 2.

3.19 Surry, Unit 2, Relief Request P-4

The licensee has requested relief from OM Table ISTB-3500-1 and ISTB-3510(b)(1). Table ISTB-3500-1 requires that Group A test pressure instrument accuracy shall be within ± 2 percent. ISTB-3510(b)(1) requires that the full-scale range of each analog instrument shall be not greater than three times the reference value.

3.19.1 Component Identification

The components affected by this relief request are Boric Acid Transfer Pumps 1-CH-P-2C and 1-CH-P-2D. The pumps are classified as Group A pumps in the IST Program and function to supply boric acid to the suction of the charging pumps for emergency boration.

3.19.2 Licensee's Basis for Requesting Relief

Basis for Relief (Table ISTB-3500-1)

> Calibrating the inlet pressure instruments for the boric acid transfer pumps to an accuracy within ± 2% has proven difficult and may be impractical in the future with the current instruments. Calibrating the inlet pressure instruments to an accuracy within ± 3% would be practical.

Basis for Relief (Table ISTB-3510(b)(1))

> The inlet pressure gauges have a full scale range of 0 to 15 psig. These instruments were sized by evaluating the static pressures present at the suction side of the pumps and applying the three times rule of ISTB-3510(b)(1). The static pressures range from 6 to 7 psig.
>
> When the pumps are started, the pressure at the suction side of the pumps drops to approximately 2 psig; therefore, the inlet pressure gauges do not meet the three times rule for dynamic inlet pressure.
>
> Using a lower range pressure gauge (i.e. 0 to 5 psig) would meet the three times rule for dynamic inlet pressure; however, the lower range gauge would be repeatedly exposed to an over range condition (static pressures in excess of 5 psig) which would damage the instruments.
>
> Using a lower range temporary gauge on a quarterly basis presents a hardship because the process fluid contains boric acid and is contaminated. If contaminated, the temporary instruments would probably become waste material. However, with the current 0 to 15 psig inlet pressure gauges calibrated to ± 3%, a differential pressure can be determined that exceeds the accuracy requirements for differential pressure.
>
> Each boric acid transfer pump discharge pressure gauge (0 to 150 psig range) has an instrument loop accuracy of 1.59%. Computing the maximum error for differential pressure using the current instrument configuration and an inlet pressure gauge accuracy of ± 3%, yields an error of 2.85 psid.

Computing the Code allowed error for differential pressure for an inlet pressure gauge with a 2% accuracy and a 0 to 5 psig range and a discharge pressure instrument with a 2% accuracy and a 0 to 150 psig range yields an error of 3.1 psid. With the current instrument configuration, the loop accuracy of each discharge pressure instrument could be as high as 1.75%, which equates to a 3.075 psid error, and still be within the Code allowed error of 3.1 psid for differential pressure. Therefore, for purposes of trending pump degradation using differential pressure and flow, the current instrument is adequate as long as the discharge pressure instrument loop accuracies remain at or below 1.75%.

3.19.3 Proposed Alternate Testing

As an alternative, the licensee has proposed to use inlet pressure gauges with a full-scale range of 0 to 15 psig and calibrated to an accuracy within ± 3 percent to measure dynamic inlet pressures. Also, the licensee committed to maintain loop accuracies for the discharge pressure gauges at or below an accuracy of 1.75 percent to ensure that the differential pressure error is below the differential pressure error allowed by the Code.

3.19.4 Staff Evaluation

The boric acid transfer pumps 1-CH-P-2C and 1-CH-P-2D are pumps that supply boric acid to the suction of the charging pumps for emergency boration. The inlet pressures to these boric acid transfer pumps vary significantly between their standby and operating modes. The static inlet pressure available to the pumps during operation is 6 to 7 psig. However, when the pumps are started, the inlet pressure drops to about 2 psig. When the inlet pressure drops to 2 psig, in accordance with the requirements of ISTB-3510(b)(1), the inlet gauges must have a range of 0 to 6 psig. The use of a 0 to 6 psig range gauge would be unsuitable at static inlet pressures due to the possibility of damaging the gauge by over-ranging.

The ASME OM Code, Table ISTB-3500-1, requires that Group A test pressure instrument accuracy be within ± 2 percent; and ISTB-3510(b)(1) requires that the full-scale range of each analog instrument not be greater than three times the reference value. The licensee has requested relief because it has determined that the instruments do not meet the accuracy and range requirements for the boric acid transfer pumps 1-CH-P-2C and 1-CH-P-2D. As such, the licensee has proposed an alternative to the Table ISTB-3500-1 and ISTB-3510(b)(1) requirements that would test the pumps with a 0 to 15 psig, full-scale range inlet pressure gauge, accurate to within ± 3 percent for the measurement of dynamic inlet pressures. Additionally, the licensee stated that the loop accuracies for the discharge pressure gauges will be maintained at or below an accuracy of 1.75 percent to ensure that the differential pressure error is below the differential pressure error allowed by the Code.

The NRC staff has reviewed the Table ISTB-3500-1 and ISTB-3510(b)(1) requirements. The intent of ISTB is to ensure that the range and accuracy readings obtained from flow and pressure instrumentation is within a range small enough to make degradation monitoring meaningful. The licensee's proposed alternative meets the intent of the ISTB Code requirements. The licensee will calibrate the accuracy of the 0 to 15 psig range inlet pressure gauges to within ± 3 percent and will maintain loop accuracies for the discharge pressure gauges at or below an accuracy of 1.75 percent. This alternative will provide reasonable assurance that the boric acid transfer pumps 1-CH-P-2C and 1-CH-P-2D are operationally

ready. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the alternative is authorized on the basis that it provides an acceptable level of quality and safety.

3.20 Surry, Unit 2, Relief Request P-5

The licensee has requested relief from OM ISTB-3510(b)(1). ISTB 3510(b)(1) requires that the full-scale range of each analog instrument shall be not greater than three times the reference value.

3.20.1 Component Identification

The components affected by this relief request are charging pump cooling water pumps 2-CC-P-2A and 2-CC-P-2B. The pumps are classified as Group A pumps in the IST Program and function to supply cooling water to transfer heat from the charging pump mechanical seals.

3.20.2 Licensee's Basis for Requesting Relief

> Recently installed inlet pressure gauges have a full scale range of 0 to 3.5 psig. Readings from these inlet pressure gauges over the past year indicate that the dynamic pressures fall within the bottom third of full scale. However, the difference in the error between the 0 to 3.5 psig gauges and gauges that would meet the three times full-scale rule are so small that the 0 to 3.5 psig gauges can be considered to be equivalent in terms of accuracy for determining differential pressure.
>
> For example, inlet pressures as low as 0.5 psig have been recorded for pump 2-CC-P-2B. A gauge that meets the three times full-scale rule would have a full scale of 1.5 psig or less. A 2% accuracy for the 1.5 psig gauge translates to an error of 0.03 psig. A 2% accuracy for the 3.5 psig gauge translates to an error of 0.07 psig. The difference in error of 0.04 psig is insignificant when determining the differential pressures for these pumps which range between 50 and 60 psig. Therefore, the two gauges can be considered to be equivalent in terms of accuracy for determining differential pressure.

3.20.3 Proposed Alternate Testing

The licensee proposes to measure pump suction pressure with gauges that have a full scale of 0 to 3.5 psig.

3.20.4 Staff Evaluation

These charging pump cooling water pumps are Group A, Class 3 pumps that are part of the CCW System. The pumps supply cooling water to transfer heat from the charging pump mechanical seals. These pumps have been recorded to have inlet pressures as low as 0.8 psig and commonly have differential pressures that range from 50 to 60 psig.

The ASME OM Code, ISTB-3510(b)(1), requires that the full-scale range of each analog instrument shall be not greater than three times the reference value. In accordance with 10 CFR 50.55a(a)(3)(i), the licensee has requested relief from ISTB Code requirements because the use of a gauge with a full-scale range of 0 to 3.5 psig would provide an adequate

level of quality and safety for the measurement of inlet pressures to the charging pump cooling water pumps 2-CC-P-2A and 2-CC-P-2B.

The NRC staff has reviewed the ISTB-3510(b)(1) requirements in accordance with the licensee's request for relief and has determined that there would be a negligible accuracy error in determining the differential pressures across the charging pump cooling water pumps 2-CC-P-2A and 2-CC-P-2B when a 0- to 3.5-psig gauge is used as compared to a gauge that would meet the three times full-scale rule. The use of the inlet pressure gauge with a full-scale range of 0 to 3.5 psig will provide an acceptable level of quality and safety for the operation of the charging pump cooling water pumps. Therefore, in accordance with 10 CFR 50.55a(a)(3)(i), the alternative is authorized for the fourth 10-year IST interval at Surry, Unit 2.

3.21 Surry, Unit 2, Relief Request P-6

The licensee has requested relief from the CPT requirements of OM Code, subparagraphs ISTB-3300(e)(1) and ISTB-5110(a). Paragraph ISTB-3300(e)(1) states, "Reference values shall be established within ± 20 percent of pump design flow rate for the comprehensive test." ISTB-5110(a) (Preservice Testing) requires that in systems where resistance can be varied, the flow rate and differential pressure shall be measured at a minimum of 5 points. Additionally, if practicable, these points shall be from pump minimum flow to at least pump design flow.

The licensee proposes to perform quarterly Code-required testing of the containment spray pumps at approximately 50 percent of minimum design flow in lieu of performing the biennial CPT within ± 20 percent of design flow. The components affected by this relief request are Containment Spray Pumps 2-CS-P-1A and 2-CS-P-1B, which are classified as Group B pumps in the IST Program. The containment spray pumps provide a cooled, chemically treated, borated spray to reduce containment pressure following a LOCA.

3.21.1 Licensee's Basis for Requesting Relief

The test loop for the containment spray pumps consists of an 8-inch pump discharge line feeding into a 4-inch recirculation line, which connects to a 6-inch header that discharges to the RWST. The containment spray pumps take suction from the RWST. With this 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. During the construction period in 1972, the system was flushed to remove particulate matter that could plug the spray nozzles. A recirculation test was also performed at approximately 50-percent design flow. Pump differential pressure was not recorded for the recirculation test.

The licensee stated that reestablishing this 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. Additionally, the licensee indicated that even if the spray headers were accessible, the modification of the system would present a variety of substantial challenges, such as plugging 234 spray nozzles, conducting the flow test, and returning of the system to its operable configuration. Specifically, these challenges are due to the complexity of the temporary modifications, the labor intensive nature of the modifications, and the post-modification testing needed to ensure that the system is returned to the original configuration.

A reference flow rate of at least 2560 gpm is required to be within 20 percent of the pump design flow of 3200 gpm. Currently, reference flows are typically established near 1600 gpm, approximately 50 percent of design flow. The licensee stated that this is the highest flow that can be measured while maintaining stable test conditions, and that testing at the reference flows will detect pump degradation because the pump curve is well sloped at the point of testing.

The containment spray pumps are included in the Surry Predictive Maintenance Program. For the containment spray pumps, this program employs predictive monitoring techniques, such as vibration monitoring and oil sampling and analysis.

The licensee stated that testing the containment spray pumps over the full range of the pump curve and measuring at least five points along the curve is impractical. As an alternative for the pre-service test, the licensee has proposed to measure two points at approximately 20 percent and 50 percent of design flow.

3.21.2 Proposed Alternate Testing

The licensee proposes that comprehensive test reference flows be established to within approximately 50 percent of pump design flow and that pre-service tests be conducted using two points on the pump curve at approximately 20 percent and 50 percent of pump design flow. The containment spray pumps are subject to the testing, trending, and diagnostic analysis requirements of the Surry Predictive Maintenance Program.

3.21.3 Staff Evaluation

The Surry containment spray pumps fall within the scope of the ASME OM Code and are defined as Group B Pumps. As such, these pumps are subject to quarterly Group B tests and a biennial CPT. Pump speed as well as differential pressure or flow rate are required to be monitored for the Group B test for the containment spray pumps. Additionally, speed, differential pressure, flowrate, discharge pressure, and vibration are required for the comprehensive test. ASME OMb 2000, paragraph ISTB-3300(e)(1) requires the establishment of reference values for the CPT to be within $\pm$ 20 percent of pump design flow. The Code does not define design flow.

In their current configuration, the containment spray pumps are tested using a test line that recirculates flow back to the RWST. Total flow during the quarterly pump test is approximately 1600 gpm. Considering the range of stated flows, the proposed test flow is approximately 20 percent to 50 percent of design flow. The containment spray system flow path currently available that could produce the required flow is a direct suction off the RWST through the containment spray header. This method would spray containment with a solution of sodium hydroxide and borated water and would require an extensive post-test cleanup. This test method would be detrimental to the installed-carbon steel components and non-qualified electrical circuits and is, thus, impractical.

The CPT—which first appeared in the 1995 Edition of the OM Code—results in a more accurate assessment of the pump's operational readiness and performance characteristics at a reduced frequency (once every refueling cycle versus once every 3 months). The test is intended to be conducted at or near a pump's design flow rate because this area of the pump curve is

considered to be most representative of the pump's design performance characteristics. The quarterly Group A or B test is primarily a qualitative test to detect gross mechanical or hydraulic failures and not to assess hydraulic performance capabilities or to detect minor imbalances through vibration measurements.

ASME OMb 2000, paragraph ISTB-3300(e)(2) requires reference values for Group B tests to be within ± 20 percent of pump design flow, if practicable. If not practicable, the reference point shall be established at the highest practical flow rate. The licensee states that this is approximately 50 percent of the stated design flows. The licensee did not adequately justify how operation at the lower flow confirms the capability of the pump to perform as required under design flow conditions nor how it meets the intent of the CPT.

ASME OMb 2000b, paragraph ISTB-5110(a) requires that flow rate and differential pressure be measured at a minimum of 5 points in systems where flow can be varied. The licensee proposes to test 2 points. Two points can only generate a line and is not adequate to project pump performance at elevated flows.

The licensee stated that the pumps' pre-service testing was a system flush and recirculation test. No vibration measurements were taken and the original test data is not verifiable. Pump test curves were provided; however, the containment spray system has never been operated near design parameters in its as-installed configuration.

The proposed test monitors discharge pressure and vibration more frequently than a Group B test. Increased monitoring of vibration may detect minor imbalances and may aid in condition assessment and assessment of pump degradation. The use of lube oil sampling and analysis is also a good practice and can aid in the condition assessment of rotating equipment. However, the additional monitoring and sampling does not compensate for not testing at higher flow rates nor do they assess hydraulic performance capabilities under design flow conditions.

The NRC staff finds that the proposed alternative does not provide an acceptable level of quality or safety because the alternative does not provide reasonable assurance of the operational readiness of the containment spray pumps to perform their safety functions at design basis-conditions. For the long-term assessment of the operational readiness of the pump, it is necessary that a test be performed at or near the pump's design flow rate or where the pump design performance characteristics are well represented.

In addition, the licensee did not demonstrate that compliance with Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Although the need to implement plant modifications at an estimated cost of $879,000 (necessary to test the pumps at or near the pump's design flow rate) may be a hardship, these modifications will provide the Code-required testing capability to verify operational readiness of the containment spray pumps at design-basis conditions. This capability to perform a full-flow test as required by the CPT provides an increase in the level of quality and safety commensurate with the associated costs. Consequently, the CPT will provide a technically sound evaluation and reliable assessment of the pump's operational readiness and performance characteristics under design-basis accident conditions. This evaluation and assessment of design performance provides reasonable assurance that the containment spray system will accomplish its safety-related functions.

The licensee has not adequately demonstrated that meeting the requirements of the CPT is impractical. The NRC staff finds that the approach proposed by the licensee in its response dated June 25, 2003, as supplemented by letter dated December 17, 2003, has not considered less costly alternatives. Therefore, Relief Request P-6 is denied for Surry, Unit 2.

3.22 Surry, Unit 2, Relief Request P-7

The licensee has requested relief from the CPT requirements of OM Code, subparagraphs ISTB-3300(e)(1) and ISTB-5210(a). Paragraph ISTB-3300(e)(1) requires reference values to be established within ± 20 percent of pump design flow rate for the comprehensive test. ISTB-5210(a) (Preservice Testing) requires that for systems where the resistance can be varied, the flow rate and differential pressure shall be measured at a minimum of 5 points. Furthermore, if practicable, these points shall be from pump minimum flow to at least pump design flow.

The licensee proposes to perform quarterly Code-required testing of the containment spray pumps at approximately 36 percent of minimum design flow in lieu of performing the biennial CPT within ± 20 percent (80 to 120 percent) of design flow. The components affected by this relief request are Recirculation Spray Pumps 2-RS-P-2A and 2-RS-P-2B, which are classified as Group B pumps in the IST Program. The outside recirculation spray pumps supply borated spray to cool and depressurize the containment atmosphere following a containment depressurization actuation signal and maintain the containment in a subatmospheric condition, following an accident.

3.22.1 Licensee's Basis for Requesting Relief

The outside recirculation pumps are long shaft pumps with the shaft and impeller enclosed in a 52-foot casing. The pump impellers are located near the bottom of the casing. The test loop for the outside recirculation pumps consists of a 10-inch pump discharge line feeding into a 4-inch recirculation line that feeds back to the pump casing. With this test loop installed, pump design flow cannot be established. Reference flows are typically established with this test loop in the range of 1100 gpm, whereas the pump required flow is 3000 gpm. The discharge piping was not designed to be temporarily reconfigured so that pump design flow could be achieved.

Pre-operational testing, which was performed during initial construction in 1972, consisted of a shutoff head verification test (no flow), a low-flow test through the existing 4-inch test loop, and a system flush to remove particulate matter. Flow was not established to the spray headers. Differential pressures were not measured, and the flows observed during the low-flow test were not verified.

A reference flow of 2400 gpm is required to be within 20 percent of the pump design flow of 3000 gpm. The licensee currently established reference flows in the range of 1100 gpm, which is not within 20 percent of design flow. As an alternative to testing at 80 to 120 percent of the design flow, the licensee proposes to establish reference values at 36 percent of design flow or approximately 1100 gpm. The licensee stated that testing at the reference flows will detect pump degradation because the pump curve is well sloped at the point of testing.

The outside recirculation pumps are included in the Surry Predictive Maintenance Program. For these pumps this program employs predictive monitoring techniques such as vibration

monitoring and oil sampling and analysis. The licensee stated that 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 for the pre-service test, the licensee proposed to measure a single point at approximately 36 percent of design flow.

3.22.2 Proposed Alternate Testing

The licensee proposes that a comprehensive test reference flow be established at approximately 36 percent of pump design flow. A pre-service test will be conducted using a single point on the pump curve. The outside recirculation spray pumps are subject to the testing, trending, and diagnostic analysis of the Surry Predictive Maintenance Program.

3.22.3 Staff Evaluation

The Surry outside recirculation spray pumps fall within the scope of the ASME OM Code and are defined as Group B Pumps. These pumps are subject to quarterly Group B tests and a biennial CPT. Pump speed as well as differential pressure or flow rate are required to be monitored for the Group B test for the outside recirculation spray pumps. Additionally, speed, differential pressure, flowrate, discharge pressure, and vibration are required for the comprehensive test. ASME OMb 2000, paragraph ISTB-3300(e)(1) requires the establishment of reference values for the CPT to be within $\pm$ 20 percent of pump design flow. The Code does not define design flow.

In their current configuration, the recirculation spray pumps are tested using a test line that recirculates flow back to the RWST. Total flow during the quarterly pump test is approximately 1100 gpm, which is approximately 36 percent of design flow. There is no recirculation spray system flow path currently available that could produce the required flow. The pumps have never operated in any condition other than in a recirculation mode. Flow has never been established to the spray headers and design-basis capability has never been field verified.

The CPT—which first appeared in the 1995 Edition of the OM Code—results in a more accurate assessment of the pump's operational readiness and performance characteristics at a reduced frequency (once every refueling cycle versus once every 3 months). The test is intended to be conducted at or near a pump's design flow rate because this area of the pump curve is considered to be most representative of the pump's design performance characteristics. The quarterly Group A or B test is primarily a qualitative test to detect gross mechanical or hydraulic failures and not to assess hydraulic performance capabilities or to detect minor imbalances through vibration measurements.

ASME OMb 2000, paragraph ISTB-3300(e)(2) requires reference values for Group B tests to be within $\pm$ 20 percent of pump design flow, if practicable. If not practicable, the reference point shall be established at the highest practical flow rate. The licensee states that this is approximately 50 percent of the stated design flows. The licensee did not adequately justify how operation at the lower flow confirms the capability of the pump to perform as required under design flow conditions nor how it meets the intent of the CPT. ASME OMb 2000b, paragraph ISTB-5210(a) requires that flow rate and differential pressure be measured at a minimum of 5 points in systems where flow can be varied. The licensee proposes to test a single point. One point cannot generate a curve and is not adequate to project pump performance at elevated flows.

The licensee stated that the pumps' pre-service testing was a system flush, shut-off head test, and recirculation test. No vibration measurements were taken, and the original test data is not verifiable. Pump test curves were provided, however, the recirculation spray system has never been operated near design parameters in its as-installed configuration.

The proposed test monitors discharge pressure and vibration more frequently than a Group B test. Increased monitoring of vibration may detect minor imbalances and may aid in assessment of pump degradation. The use of lube oil sampling and analysis is also a good practice and can aid in the condition assessment of rotating equipment. However, the additional monitoring and sampling does not compensate for not testing at higher flow rates nor do they assess hydraulic performance capabilities under design flow conditions.

The NRC staff finds that the proposed alternative does not provide an acceptable level of quality or safety because the alternative does not provide reasonable assurance of the operational readiness of the containment spray pumps to perform their safety functions at design-basis conditions. For the long-term assessment of the operational readiness of the pump, it is necessary that a test be performed at or near the pump's design flow rate or where the pump design performance characteristics are well represented.

In addition, the licensee did not demonstrate that compliance with Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Although the need to implement plant modifications at an estimated cost of $1,300,000 (necessary to test the pumps at or near the pump's design flow rate) may be a hardship, these modifications will provide the Code-required testing capability to verify operational readiness of the containment spray pumps at design-basis conditions. This capability to perform a full-flow test as required by the CPT provides an increase in the level of quality and safety commensurate with the associated costs. Consequently, the CPT will provide a technically sound evaluation and reliable assessment of the pump's operational readiness and performance characteristics under design-basis accident conditions. This evaluation and assessment of design performance provides reasonable assurance that the recirculation spray system will accomplish its safety-related functions.

The licensee has not adequately demonstrated that meeting the requirements of the CPT is impractical. The NRC staff finds that the approach proposed by the licensee in its submittal dated June 25, 2003, as supplemented by letter dated December 17, 2003, has not considered less costly alternatives. Therefore, Relief Request P-7 is denied for Surry, Unit 2.

3.23 Surry, Unit 2, Relief Request V-1

The licensee has requested relief from ISTC paragraphs 5131, 5132, and 5133. ISTC-5131 requires that the stroke time of active pneumatically operated valves shall be measured, a limiting value of full-stroke time shall be specified by the owner, the valve stroke shall be measured to at least the nearest second, and any abnormality or erratic action shall be recorded and evaluated. ISTC-5132 requires that measured stroke times be compared to the acceptance criteria in this section. ISTC-5133 requires that corrective action be taken if the measured stroke times do not meet the acceptance criteria in ISTC-5122.

3.23.1 Component Identification

The components affected by this relief request are as listed in the table below.

Valve Number	System	OM Category	ASME Class	Function
2-CC-LCV-201	Component Cooling	B	3	Charging Pump Seal Cooling Surge Tank Level Control Valve
2-CH-FCV-2113A	Chemical and Volume Control	B	3	Alternate Emergency Boration Line Flow Control Valve
2-CH-FCV-2114A	Chemical and Volume Control	B	3	Primary Grade Water Flow Control Valve
2-MS-RV-201A 2-MS-RV-201B 2-MS-RV-201C	Main Steam	B	2	Main Steam Header Discharge to Atmosphere Pressure Control Valves
2-SW-TCV-208A 2-SW-TCV-208B 2-SW-TCV-208C	Service Water	B	3	Service Water to Charging Pump Lube Oil Cooler Temperature Control Valves

3.23.2 Licensee's Basis for Requesting Relief

In its request the licensee stated that ISTC-1200(b) excludes valves that are used only for system control, such as pressure-regulating valves, from the testing requirements of the Code. The licensee also stated that if these valves have a safety function that fails to an open or close position, then the testing requirements for power-operated valves are imposed. As such, 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 safety function. The power-operated control valves listed in the table above have only a fail-safe function and the alternative rules described in Code Case OMN-8 will be applied to the control valves listed in Table V-1 of the licensee's submittal as an alternative to the requirements of OM Code Sections ISTC-5131, ISTC-5132, and ISTC-5133.

3.23.3 Proposed Alternate Testing

The licensee proposes to test the control valves listed in the table above to the requirements of Code Case OMN-8.

3.23.4 Staff Evaluation

The valves shown on Table V-1 of the licensee's submittal are pneumatically operated valves that use compressed air energy to control the movement of the valve stem. These valves function as system control devices and have a fail-safe safety function. These valves are maintained and tested in accordance with the ASME OM Code, Section ISTC-5130, which outlines testing and corrective action procedures for all pneumatically operated valves.

Specifically, Subsection ISTC-5131 states that the stroke time of all valves shall be measured to at least the nearest second, the limiting value(s) of full-stroke time of each valve shall be specified by the owner, and any abnormality or erratic action shall be recorded and evaluated. Additionally, Subsection ISTC-5133 requires that corrective action be taken if the measured stroke times do not meet the requirements of ISTC-5132, which outlines acceptance criteria for measured stroke times.

In accordance with 10 CFR 50.55a(a)(3)(i), the licensee has requested relief from the above ASME OM Code requirements in order to implement the provisions of 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, power-operated control valves that have only a fail-safe safety function need not meet the requirements of ASME OM Code-2001, ISTC-5131, "Valve Stroke Testing," ISTC-5132, "Stroke Test Acceptance Criteria," and ISTC-5133(b). Code Case OMN-8 has been reviewed by the NRC staff and found acceptable with no conditions in RG 1.192, which has been incorporated by reference into 10 CFR 50.55a.

Therefore, Relief Request V-1 is unnecessary and the licensee may use Code Case OMN-8 for its fourth 10-year interval at Surry, Unit 2.

3.24 Surry, Unit 2, Relief Request V-2

The licensee has requested relief from ISTC-3630(f). ISTC-3630(f) requires that valves or valve combinations with leakage rates exceeding the values specified by the Owner shall be declared inoperable and either repaired or replaced.

3.24.1 Component Identification

The components affected by this relief request are the following RWST Isolation Valves. The valves are Class 2, Category A and A/C valves.

Valve(s):	2-CH-MOV-2115B	2-SI-MOV-2885A
	2-CH-MOV-2115D	2-SI-MOV-2885B
	2-SI-25	2-SI-MOV-2885C
		2-SI-MOV-2885D

3.24.2 Licensee's Basis for Requesting Relief

Valves 2-CH-MOV-2115B and D, and 2-SI-25 are in the supply line to the charging pumps from the RWST. Valves 2-SI-MOV-2885A, 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 pumps 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 leakages from each valve have been measured and summed, 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 adequately.

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 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. Evaluations will be documented and retained in plant records, and are available for subsequent review. This alternative to the requirements ISTC-3630(f) provides an acceptable level of quality and safety.

3.24.3 Proposed Alternate Testing

The licensee proposes to perform an evaluation 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. Therefore, no repair or replacement would be 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. This evaluation would be in addition to repair or replacement activities performed as corrective actions.

3.24.4 Staff Evaluation

Category A valves 2-CH-MOV-2115B and D, 2-SI-25, and 2-SI-MOV-2885A, B, C, and D function to isolate the RWST in order to protect it from the highly contaminated water that is circulated from the containment sump to the reactor vessel during the recirculation mode. These valves do not have leakage requirements based on an owner's 10 CFR Part 50, Appendix J program, although in accordance with the ASME OM Code, Section ISTC-3630 and Paragraph ISTC-3630(a), they are required to be tested biennially in order to verify that their seat leakages are within acceptable limits. If a valve's seat leakage rate exceeds the specified value set by the owner, Paragraph ISTC-3630(f) requires corrective actions be performed on the valve that would declare it inoperable and have it either be repaired or replaced.

In accordance with 10 CFR 50.55a(a)(3)(i), the licensee requested relief from Paragraph ISTC-3630(f) requirements in order to conduct an evaluation in addition to performing the repair or replacement activities as corrective actions. Specifically, the proposed evaluation would demonstrate that the overall leakage rate to the RWST would be maintained below the overall allowable RWST leakage rate even if one of the RWST isolation valves in question exceeds its permissible leakage rate throughout a subsequent 24-month interval. As a result of this evaluation, the licensee proposed that repair or replacement activities could be delayed for an individual RWST isolation valve that exceeds its permissible leakage rates because of the ability of the group of RWST isolation valves to maintain the overall leakage to the RWST below

the overall allowable leakage rate. The licensee stated that this proposed alternative would provide adequate indication of valve performance and would continue to provide an acceptable level of quality and safety.

The NRC staff has concluded that the failure of any valve to meet ASME OM Code acceptance criteria indicates that the valve is degraded and may not be capable of performing its safety function. However, the NRC staff notes that the leakage rate limits for the individual RWST isolation valves are derived. The only leakage limit sensitive to RWST isolation valves is the overall leakage limit to the RWST. Therefore, exceeding individual valve leakage rate limits does not necessarily indicate that the group of RWST isolation valves cannot meet their leaktight safety function unless the leakage limit to the RWST is exceeded throughout the subsequent 2-year interval. Thus, applying the analysis of leakage rates and corrective action requirements of Paragraph ISTC-3630(f) in this situation may not be appropriate because the group of RWST isolation valves may be able to meet the leaktight safety function.

However, the NRC staff concludes that if one of the RWST isolation valves in question exceeds its leakage rate limit, it indicates that the valve has not seated tightly and that significant valve degradation problems could result due to a failure of the valve not traveling 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 that 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-3630, but it also will not meet the valve-exercising requirements of section ISTC-3500.

The licensee addressed the above concerns in its response to the NRC staff's RAI dated December 17, 2003. The licensee's RAI response included a 10-year leakage history for each of the RWST isolation valves in question and a detailed description of how the proposed alternative can neglect an individual RWST isolation valve's leakage rate as long as the allowable RWST system leakage is not exceeded. Also, in the licensee's RAI response, an RWST system leakage of 16.67 ml/min was evaluated against the Surry LOCA dose analysis. The leakage rate of 16.67 ml/min was based on the assumption that all of the valves in the identified RWST flow paths were leaking at 10 times their designed leak rates (where the design leak rates are the Westinghouse Engineering leak rate specifications for a new valve based on valve type and size). When evaluated against the LOCA dose analysis, it was concluded that the leakage rate of 16.67 ml/min could be considered negligible and would not increase the dose consequences. It was also concluded that the allowable leakage could be increased to 320 ml/min and remain within the LOCA dose results. The licensee further submitted an analysis concluding that system leakage rates of up to 100 ml/min could be acceptable even if all possible iodine from leakage became airborne and was freely released to the atmosphere.

The licensee's proposed evaluation concludes that due to conservatism the potential leakage back to the RWST is negligible, the LOCA dose analysis would be maintained for a leakage rate to the RWST of up to 320 ml/min, and that allowable leakages of up to 100 ml/min could be sustained in order to have acceptable, non-filtered releases of airborne iodine to the atmosphere. Upon review of the licensee's submittal dated June 25, 2003, as supplemented by letter dated December 17, 2003, the NRC staff finds that the licensee's allowable RWST system leakage limits for each situation are conservative and provide an acceptable level of

quality and safety. Based upon this information, the NRC staff finds that the licensee's proposed alternative provides reasonable assurance that the leakage rate to the RWST will be maintained below the overall allowable RWST leakage rate even if one of the individual RWST isolation valves in question exceeds its permissible leakage rate throughout a subsequent 24-month interval.

Therefore, the NRC staff concludes that the licensee's proposed alternative, having the option of performing an evaluation as a corrective action in addition to the repair or replacement activities of Paragraph ISTC-3630(f), is authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the fourth 10-year IST interval at Surry, Unit 2. The licensee's proposed alternative provides an acceptable level of quality and safety and an adequate indication of valve performance. 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 through the subsequent 24-month interval. This alternative is authorized only for valves 2-CH-MOV-2115B, 2-CH-MOV-2115D, 2-SI-25, and 2-SI-MOV-2885A, B, C, and D and should not be used for 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 the overall leakage to the RWST limit discussed above.

3.25 Surry, Unit 2, Relief Request V-3

The licensee has requested relief from ISTC 5221(c)(3). ISTC5221(c)(3) states that least one valve from each group shall be disassembled and examined at each refueling outage. All valves in each group shall be disassembled and examined at least once every 8 years.

3.25.1 Component Identification

The component affected by this relief request is RWST Cooling System Isolation Check Valve 2-CS-45. The valve is a Class 2, Category C valve.

3.25.2 Licensee's Basis for Requesting Relief

> This two inch check valve is on the refueling water refrigeration discharge piping that returns to the refueling water storage tank (RWST). To test the valve for closure, the cooling flow through the refrigeration units must be stopped, the valve isolated and the cooling system boundary breached. Restoring the RWST cooling system to operation after the system has been exposed to the atmosphere requires a lengthy venting process. During most of the year, the RWST cooling system runs continuously to maintain the RWST water temperature below 45°F per Technical Specification Section 3.4.A.3. Therefore, it is not practical to perform a quarterly closure test.
>
> The valve is located about ten feet above the ground near the RWST and is very accessible. There are no vents or drains downstream of the valve. The upstream refrigeration units do have drains on the heat exchangers. However, [the] RWST head would have to be used to supply the differential pressure across the check valve. This test configuration could provide a drainage path for the RWST if the check valve failed open and [challenged] the integrity of the RWST system. Considering the size of the valve (2"), [its] accessibility and the problem of using RWST to perform a back pressure

test, Surry Power Station has determined that the best method for verifying closure is to disassemble and examine the valve.

The disassembly and examination could be performed during refueling outages or while the plant is operating during cool weather when the need for RWST cooling is minimal. However, during the outage the RWST is involved in several major work and test activities [that] would be complicated by the disassembly and examination. For example, during the refueling operation water is pumped from the RWST to the reactor cavity via the low head safety injection (LHSI) pumps. The process is reversed when the new fuel is in place. Also, the RWST is used during the comprehensive pump tests for the LHSI pumps, the inside recirculation spray pumps, and the containment spray pumps. The RWST cooling system should be operable to support these work and test activities. Performing work during the refueling outage that could be performed during normal operation unnecessarily complicates the outage planning process and may result in a reduced margin of plant safety. Disassembling the valve on a reactor refueling frequency but not necessarily during refueling outages meets the intent of ISTC-5221(c)(3), and does not compromise plant safety during the refueling outage.

3.25.3 Proposed Alternative Testing

The licensee proposes to verify the close position by disassembly and examination per the requirements of ISTC-5221(c) except that instead of performing the disassembly and examination during the refueling outage as required by ISTC-5221(c)(3), the disassembly and examination would be performed on a reactor refueling frequency. This refueling outage is nominally once every 18 months, but no greater than once every 24 months. Normal operation of the RWST cooling system will verify that the valve opens.

3.25.4 Staff Evaluation

The exercising of Category C check valves shall be conducted in accordance with Subsections ISTC-3510, ISTC-3522, and ISTC-5221 of the 1998 Edition of the ASME OM Code, up to and including the 2000 Addenda. ISTC-3510 requires that active Category C check valves be exercised nominally every 3 months in a manner that verifies obturator travels to the closed, full-open, or partially open position as required to fulfill its function. If exercising is not practicable during plant operation or cold shutdowns, ISTC-3522(c) permits the check valves to be full-stroke exercised during each plant's refueling outage. The most common method to full-stroke exercise a check valve open is to pass the maximum required accident flow through the valve. However, for some check valves, licensees cannot practically establish or verify sufficient flow to full-stroke exercise the valves open. In many cases, establishing design or accident flow through these valves for testing could result in damage to major plant equipment. Under such conditions, valve disassembly and inspection may be used as "other positive means" of determining if a valve's disk will full-stroke exercise open and if it has adequate seating capability.

Additional guidance for the full-flow testing and examination of check valves is provided in GL 89-04, Position 2. GL 89-04, Position 2, provides guidelines for developing a sample disassembly and inspection program when a licensee determines that it is burdensome to disassemble and inspect all applicable valves each refueling outage. The program involves

grouping similar valves and testing a least one valve in each group during each refueling outage. A different valve in each group is required to be disassembled, inspected, and manually full-stroke exercised at each successive refueling outage until the entire group has been tested. This guideline, as with the ISTC-5221(c)(3) requirements, limits disassembly and inspection of check valves to refueling outages only.

As an alternative to exercising check valves during plant operation or cold shutdowns, ISTC-5221(c)(3) permits check valves to be disassembled and inspected every refueling outage to verify operability. However, in accordance with 10 CFR 50.55a(a)(3)(i), the licensee proposed an alternative to the ISTC-5221(c)(3) requirements. The licensee stated that disassembly and examination of valve 2-CS-45 could not be performed during refueling outages because during the outage there are several major activities performed on the RWST that would make it impractical to disassemble and examine this valve. The licensee has proposed to perform the disassembly and examination of the 2-CS-45 check valve on a reactor refueling frequency, nominally once every 18 months but no greater than once every 24 months. The licensee further stated that all other disassembly and examination requirements of ISTC-5221(c) still apply.

The NRC staff recognizes that there is a trade-off, from a risk perspective, between when a valve can and cannot be disassembled and examined. The NRC staff also recognizes that the ability to disassemble and examine valves at power (when it could be needed to mitigate the consequences of a LOCA), during cold shutdown, or during an outage is significantly impacted by considerations such as the scope of the work on the system, the individual valves that are to be tested, the scheduling of work windows in the planning process, the system availability requirements, the personnel resources, and the maintenance of an acceptable risk profile. Thus, prior to performing disassembly and examination, the effect on risk must be evaluated in accordance with the requirements of 10 CFR 50.65(a)(4). Section 50.65(a)(4) of 10 CFR states, in part, “Before performing maintenance activities (including but not limited to surveillance, post-maintenance testing, and corrective and preventive maintenance), the licensee shall assess and manage the increase in risk that may result from the proposed maintenance activities.”

The NRC staff has further examined the impact on disassembling valve 2-CS-45 on a reactor refueling frequency and has determined that this proposed alternative maintains the time period between tests to a frequency equivalent to that of a refueling outage frequency. Thus, there is no change in the number of tests performed on the check valves over the life of the component. Disassembling the valve on a reactor refueling frequency but not necessarily during refueling outages, therefore, meets the intent of the ISTC-5221(c)(3) requirements. The licensee’s proposed alternative will provide adequate indication of valve performance and will continue to provide an acceptable level of quality and safety.

Therefore, the NRC staff has determined that if the licensee evaluates the effect on risk before performing disassembly and examination as required in 10 CFR 50.65(a)(4) and performs all of the other requirements of ISTC-5221(c), the disassembly and examination of the 2-CS-45 check valve may be performed on a reactor refueling frequency (nominally once every 18 months but no greater than once every 24 months). This action will provide an adequate indication of valve performance and will continue to provide an acceptable level of quality and safety. Thus, the NRC staff authorizes the licensee’s proposed alternative pursuant to 10 CFR 50.55a(a)(3)(i).

3.26 Surry, Unit 2, Relief Request V-4

The licensee has requested relief from ISTC-3522(b) and ISTC-3522(c). ISTC-3522(b) states that, "If exercising is not practicable during operation at power, it shall be performed during cold shutdowns." ISTC-3522(c) states that, "If exercising is not practicable during operation at power and cold shutdowns, it shall be performed during refueling outages."

3.26.1 Component Identification

The components affected by this relief request are Emergency and Manual Emergency Boration Line Isolation Check Valves 2-CH-225, 2-CH-227, and 2-CH-229. The valves are Class 2, Category C valves.

3.26.2 Licensee's Basis for Requesting Relief

In its request, the licensee stated that due to the current piping configuration, the check valves cannot be back-seat tested with flow. Since the valve bonnets are seal-welded, the seal weld must be cut before the valve can be disassembled. Also, the system contains a 7-percent boric acid solution. For these reasons, the licensee indicated that disassembly is not the preferred method to verify the closed position. As such, the licensee has proposed that the valves be radiographed to verify that the disks are on the seat. However, since radiography creates a potential personnel hazard due to the use of a radioactive source, the licensee is proposing to perform the radiographs infrequently.

3.26.3 Proposed Alternative Testing Frequency

The licensee has proposed to radiograph the subject valves on a reactor refueling frequency, nominally once every 18 months but no greater than once every 24 months, instead of during cold shutdowns or reactor refueling as required by ISTC-3522(b) and (c). Check valves 2-CH-225, 227, and 229 will also be full-stroke exercised every quarter during normal operation when the reactor coolant boric acid concentration is above 100 ppm.

Valves 2-CH-227 and 229 are of the same manufacturer and model number, and are subject to similar service conditions. Valve 2-CH-227 is a 2-inch valve and valve 2-CH-229 is a 1-inch valve. Therefore, these valves will be grouped together. To verify the closed position, one valve will be radiographed each test interval. This sampling plan will follow the guidance described in NUREG-1482, Section 4.1.2. Valve 2-CH-225 is of a different manufacturer and will be radiographed every test interval to verify the closed position. The closed test will be performed while the plant is at power on a reactor refueling frequency, nominally once every 18 months but no greater than once every 24 months.

3.26.4 Staff Evaluation

The exercising of Category C check valves shall be conducted in accordance with Subsections ISTC-3510, ISTC-3522, and ISTC-5221 of the 1998 Edition of the ASME OM Code, up to and including the 2000 Addenda. ISTC-3510 requires that active Category C check valves be exercised nominally every 3 months in a manner that verifies obturator travels to the closed, full-open, or partially open position as required to fulfill its function. If exercising is not practicable during plant operation, ISTC-3522(b) permits valves to be full-stroke exercised

during cold shutdowns. Additionally, if exercising is not practicable during plant operation or cold shutdowns, ISTC-3522(c) permits valves to be full-stroke exercised during each plant's refueling outage. The most common method to full-stroke exercise a check valve open is to pass the maximum required accident flow through the valve. However, for some check valves, the licensee cannot practically establish or verify sufficient flow to full-stroke exercise the valves open. In many cases, establishing design or accident flow through these valves for testing could result in damage to major plant equipment. Under such conditions, the Code allows the use of nonintrusive techniques that utilize indirect evidence or "other positive means" to verify the full stroke of check valves.

The Code allows the use of indirect evidence (such as changes in system pressure, flow, temperature, or level) or "other positive means" in accordance with ISTC 5221(a)(3) in order to verify the ability of the check valves to be full stroked or adequately seated. When nonintrusive testing techniques are used in a sampling plan, licensees may implement a program such that similar valves in the same service are grouped for testing purposes (not to exceed four valves in a single group). Additionally, nonintrusive testing by "other positive means" must be repeatable in order to meet the intent of the Code.

The licensee has proposed to use radiography to verify that check valves 2-CH-225, 2-CH-227, and 2-CH229 have seated properly. Also, in accordance with 10 CFR 50.55a(a)(3)(i), the licensee has proposed an alternative testing frequency to the requirements of ISTC-3522(b) and ISTC-3522(c). The licensee stated that the best time to perform the radiographs would be during normal plant operation when work activities and the number of workers are at a minimum. As such, the licensee proposed to perform the radiographs on a reactor refueling frequency (nominally once every 18 months but no greater than once every 24 months) in order to minimize the number of times the test personnel are exposed to the hazard of the radioactive source.

Further, the licensee proposed that check valves in question will be full-stroke exercised every quarter during normal operation (reactor coolant boric acid concentration above 100 ppm) and that the guidance described in NUREG-1482, Section 4.1.2, Rev 0, regarding the use of a sampling plan would be met. Valves 2-CH-227 and 2-CH-299 will be grouped together and one valve will be radiographed each test interval to verify the close position. Valve 2-CH-225 is, however, of a different manufacturer and will radiographed every test interval to verify the close position.

The NRC staff notes that nonintrusive techniques have been shown to be effective in verifying a full-stroke exercise of check valves by industry group testing programs and by onsite testing at commercial nuclear facilities. Various nonintrusive techniques or combinations of different techniques have also been shown to be capable of detecting degradation of check valves during testing programs and onsite testing. If performed in accordance with quality assurance program requirements, the licensee's proposed radiography testing technique is considered "other positive means" in accordance with ISTC-5221(a)(3), and relief is not required for its use except as necessary for the testing frequency alternative.

Thus, because an alternative testing frequency is requested by the licensee, relief is needed to conduct the radiography testing on the proposed reactor refueling frequency (nominally once every 18 months but no greater than once every 24 months). The NRC staff recognizes that

there is a trade-off, from a risk perspective, between when and how often radiography can be used to verify that the disks are on their seats. During radiography, valves are radiographed with a radioactive source that can create a potential personnel hazard. The NRC staff notes, therefore, that in order to reduce the number of times that test personnel are exposed to this hazard, the radiographs should be performed infrequently, and the effect on risk associated with performing any radiography must be evaluated in accordance with the requirements of 10 CFR 50.65(a)(4). Section 50.65(a)(4) of 10 CFR states, in part, “Before performing maintenance activities (including but not limited to surveillance, post-maintenance testing, and corrective and preventive maintenance), the licensee shall assess and manage the increase in risk that may result from the proposed maintenance activities.”

The NRC staff has further examined the impact on verifying the closed position of valves 2-CH-225, 2-CH-227, and 2-CH-229 on a reactor refueling frequency and has determined that this proposed alternative maintains the time period between tests to a frequency equivalent to that of a refueling outage frequency. Thus, there is no change in the number of tests performed on the check valves over the life of the component. Testing these valves using radiography on a reactor refueling frequency but not necessarily during refueling outages meets the intent of the ISTC-3522(b) and (c) requirements. The licensee’s proposed alternative will provide adequate indication of valve performance and will continue to provide an acceptable level of quality and safety.

Therefore, the NRC staff has determined that if the licensee evaluates the effect on risk before performing the radiography testing as required in 10 CFR 50.65(a)(4) and follows the guidance in NUREG-1482, radiographs may be performed to verify the close position of the 2-CH-225, 2-CH-227, and 2-CH-229 check valves during normal plant operation on a reactor refueling frequency (nominally once every 18 months but no greater than once every 24 months). The licensee shall also full-stroke exercise the applicable check valves every quarter during normal operation (when reactor coolant boric acid concentration is above 100 ppm). These actions will provide an adequate indication of valve performance and will continue to provide an acceptable level of quality and safety. Thus, the NRC staff authorizes the licensee’s proposed alternative pursuant to 10 CFR 50.55a(a)(3)(i).

3.27 Surry, Unit 2, Relief Request V-5

The licensee has requested relief from ISTC-3522(b) and ISTC-3522(c). ISTC-3522(b) states that, "If exercising is not practicable during operation at power, it shall be performed during cold shutdowns." ISTC-3522(c) states that, "If exercising is not practicable during operation at power and cold shutdowns, it shall be performed during refueling outages."

3.27.1 Component Identification

The component affected by this relief request is the Charging Pump Seal Cooling Surge Tank Makeup Valve 2-CC-806. The valve is a Class 3, Category C valve.

3.27.2 Licensee’s Basis for Requesting Relief

> With the current piping configuration, the check valve cannot be back pressure tested with flow. There is no isolation valve upstream so a freeze seal is necessary to isolate the valve for disassembly. The preferred examination method is to radiograph the valve

to verify that the disk is on the seat. Radiography creates a potential personnel hazard due to the use of a radioactive source. To reduce the number of times that test personnel are exposed to this hazard, the radiographs should be performed infrequently. Also, setup of the radioactive source, securing the area and performing the radiograph is a time consuming process that is impractical to perform every three months.

This valve is located in the auxiliary building basement at elevation 2. Performing a radiograph requires that the surrounding area be cordoned off approximately two hours before the exposure, the area cleared of personnel, and access denied to personnel before and during the period of the exposure. The area must remain free of personnel from two to four hours depending on the success of the initial exposures. The restricted area includes the auxiliary building basement.

Cold shutdown outages and reactor refueling outages are periods of high work activity. Outage work would be interrupted in a substantial portion of the auxiliary building during the preparation of the radiograph. Also, due to the increased number of workers on site during these outages, there is an increased risk of accidental exposure.

3.27.3 Proposed Alternative Testing

The licensee has proposed to perform the radiographs during normal plant operation when work activities and the number of workers are at a minimum. To reduce the number of times that test personnel are exposed to the hazard of performing the radiographs, the licensee proposes that the radiographs be performed on a reactor refueling frequency, nominally once every 18 months but no greater than once every 24 months, instead of during cold shutdown outages or reactor refueling outages as required by ISTC-3522(b) and (c).

Makeup Valve 2-CC-806 will be tested to the full-open position every reactor refueling. The close test will be performed while the plant is at power on a reactor refueling frequency, nominally once every 18 months but no greater than once every 24 months.

3.27.4 Staff Evaluation

The exercising of Category C check valves shall be conducted in accordance with Subsections ISTC-3510, ISTC-3522, and ISTC-5221 of the 1998 Edition of the ASME OM Code, up to and including the 2000 Addenda. ISTC-3510 requires that active Category C check valves be exercised nominally every 3 months in a manner that verifies obturator travels to the closed, full-open, or partially open position as required to fulfill its function. If exercising is not practicable during plant operation, ISTC-3522(b) permits valves to be full-stroke exercised during cold shutdowns. Additionally, if exercising is not practicable during plant operation or cold shutdowns, ISTC-3522(c) permits valves to be full-stroke exercised during each plant's refueling outage. The most common method to full-stroke exercise a check valve open is to pass the maximum required accident flow through the valve. However, for some check valves, licensees cannot practically establish or verify sufficient flow to full-stroke exercise the valves open. In many cases, establishing design or accident flow through these valves for testing could result in damage to major plant equipment. Under such conditions, the Code allows the use of nonintrusive techniques that utilize indirect evidence or "other positive means" to verify the full stroke of check valves.

The Code allows the use of indirect evidence (such as changes in system pressure, flow, temperature, or level) or “other positive means” in accordance with ISTC-5221(a)(3) to verify the ability of the check valves to be full stroked or adequately seated. When nonintrusive testing techniques are used in a sampling plan, licensees may implement a program such that similar valves in the same service are grouped for testing purposes (not to exceed four valves in a single group). Additionally, nonintrusive testing by “other positive means” must be repeatable in order to meet the intent of the Code.

The licensee has proposed to use radiography to verify that check valve 2-CC-806 has seated properly. In accordance with 10 CFR 50.55a(a)(3)(i), the licensee has proposed an alternative testing frequency to the requirements of ISTC-3522(b) and ISTC-3522(c). The licensee stated that the best time to perform the radiographs would be during normal plant operation when work activities and the number of workers are at a minimum. As such, the licensee proposed to perform the radiographs on a reactor refueling frequency (nominally once every 18 months but no greater than once every 24 months) in order to minimize the number of times the test personnel are exposed to the hazard of the radioactive source. The licensee further stated that the applicable valve would be tested to the full-open position every reactor refueling.

The NRC staff notes that nonintrusive techniques have been shown to be effective in verifying a full-stroke exercise of check valves by industry group testing programs and by onsite testing at commercial nuclear facilities. Various nonintrusive techniques or combinations of different techniques have also been shown to be capable of detecting degradation of check valves during testing programs and onsite testing. If performed in accordance with quality assurance program requirements, the licensee’s proposed radiography testing technique is considered “other positive means” in accordance with ISTC-5221(a)(3), and relief is not required for its use except as necessary for the testing frequency alternative.

Thus, because an alternative testing frequency is requested by the licensee, relief is needed to conduct the radiography testing on the proposed reactor refueling frequency (nominally once every 18 months but no greater than once every 24 months). The NRC staff recognizes that there is a trade-off, from a risk perspective, between when and how often radiography can be used to verify that the disks are on their seats. During radiography, valves are radiographed with a radioactive source that can create a potential personnel hazard. Therefore, the NRC staff notes that to reduce the number of times that test personnel are exposed to this hazard, the radiographs should be performed infrequently, and the effect on risk associated with performing any radiography must be evaluated in accordance with the requirements of 10 CFR 50.65(a)(4). Section 50.65(a)(4) of 10 CFR states, in part, “Before performing maintenance activities (including but not limited to surveillance, post-maintenance testing, and corrective and preventive maintenance), the licensee shall assess and manage the increase in risk that may result from the proposed maintenance activities.”

The NRC staff has further examined the impact on verifying the closed position of valve 2-CC-806 on a reactor refueling frequency and has determined that this proposed alternative maintains the time period between tests to a frequency equivalent to that of a refueling outage frequency. Thus, there is no change in the number of tests performed on the check valve over the life of the component. Testing the valve using radiography on a reactor refueling frequency but not necessarily during refueling outages, therefore, meets the intent of the ISTC-3522(b) and (c) requirements. The licensee’s proposed alternative will provide adequate indication of valve performance and will continue to provide an acceptable level of quality and safety.

Therefore, the NRC staff has determined that if the licensee evaluates the effect on risk before performing the radiography testing as required in 10 CFR 50.65(a)(4) and performs all of the other requirements of ISTC-5221, radiography may be performed to verify the close position of the 2-CC-806 check valve while the plant is at power on a reactor refueling frequency (nominally once every 18 months but no greater than once every 24 months). The licensee shall also test the applicable valve to the full-open position every reactor refueling. These actions will provide an adequate indication of valve performance and will continue to provide an acceptable level of quality and safety. Thus, the NRC staff authorizes the licensee's proposed alternative pursuant to 10 CFR 50.55a(a)(3)(i).

4.0 CONCLUSIONS

Based on its review of the licensee's requests for relief for Surry, Unit 1, the NRC staff finds that the licensee's proposed alternatives that are described in Relief Requests P-1, P-3, P-4, P-5, P-6, P-7, V-2, V-3, V-4, V-5, and V-6 provide an acceptable level of quality and safety and are authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the fourth 10-year IST interval at Surry, Unit 1.

Additionally, the NRC staff has determined for Surry, Unit 1, Relief Request P-2 that imposing certain Code requirements is impractical. Therefore, the licensee's request for relief is granted pursuant to 10 CFR 50.55a(f)(6)(i) for the fourth 10-year IST interval at Surry, Unit 1. Additionally, the following conditions are imposed by the NRC staff pursuant to 10 CFR 50.55a(f)(6)(i): (1) During either refueling outages or cold shutdowns, pumps 1-RH-P-1A and 1-RH-P-1B shall be tested prior to being put into service and declared operable. This test will remain valid for a period of three months. (2) During refueling outages or cold shutdowns that extend beyond a three month period, the licensee shall test these pumps once every three months. (3) During back to back refueling outages or cold shutdowns that occur beyond any three month test period, the licensee shall test these pumps once every three months. Granting relief will not endanger life or property or the common defense and security and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

The NRC staff has reviewed Surry, Unit 1, Relief Requests P-8 and P-9 and finds that the proposed alternatives to test the pumps are not acceptable, and these relief requests are denied.

For Surry, Unit 2, the NRC staff finds that the licensee's alternatives proposed in Relief Requests P-1, P-3, P-4, P-5, V-2, V-3, V-4, and V-5 provide an acceptable level of quality and safety. Therefore, these alternatives are authorized pursuant to 10 CFR 50.55a(a)(3)(i). The alternatives are authorized for the fourth 10-year IST interval at Surry, Unit 2.

Furthermore, the NRC staff has determined for Relief Request P-2 that imposing certain Code requirements is impractical. Therefore, the licensee's request for relief is granted pursuant to 10 CFR 50.55a(f)(6)(i) for the fourth 10-year IST interval at Surry, Unit 2. Additionally, the following conditions are imposed by the NRC staff pursuant to 10 CFR 50.55a(f)(6)(i):
(1) During either refueling outages or cold shutdowns, pumps 2-RH-P-1A and 2-RH-P-1B shall be tested prior to being put into service and declared operable. This test will remain valid for a period of 3 months. (2) During refueling outages or cold shutdowns that extend beyond a 3-month period, the licensee shall test these pumps once every 3 months. (3) During

back-to-back refueling outages or cold shutdowns that occur beyond any 3-month test period, the licensee shall test these pumps once every 3 months. Granting relief will not endanger life or property or the common defense and security and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

The NRC staff has reviewed Surry, Unit 2, Relief Requests P-6 and P-7 and finds that the proposed alternatives to test the pumps are not acceptable, and these relief requests are denied.

In Relief Request V-1 for Surry, Units 1 and 2, the licensee proposes to use ASME OM 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.” This Code case has been found acceptable by the NRC staff in RG 1.192, “Operation and Maintenance Code Case Acceptability, ASME OM Code,” dated June 2003 and may be used without further NRC review and approval. Therefore, the licensee’s request for authorization of Relief Request V-1 is unnecessary, and no further action is required by the NRC staff.

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