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TECHNICAL EVALUATION REPORT
PUMP AND VALVE INSERVICE TESTING PROGRAM
SURRY POWER STATION UNITS 1 AND 2

Docket Numbers 50-280 and 50-281

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ABSTRACT

This report presents the results of our evaluation of the Surry Power Station, Units 1 and 2, Inservice Testing program for safety-related pumps and valves.

PREFACE

This report is part of the "Technical Assistance in Support of Operating Reactors Inservice Testing Relief Requests" program conducted for the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Mechanical Engineering Branch, by EG&G Idaho, Inc., DOE/NRC Support Programs.

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SURRY POWER STATION UNITS 1 AND 2

1. INTRODUCTION

This report provides the results of the technical evaluation of certain relief requests from the pump and valve inservice testing (IST) program for Surry Power Station, Units 1 and 2, submitted by Virginia Electric and Power Company.

Section 2 presents Virginia Electric and Power Company's bases for requesting relief from the requirements for pumps followed by an evaluation and conclusion. Section 3 presents similar information for valves. Section 4 presents a discussion of Cold Shutdown Justifications and Reactor Refueling Justifications. The pumps and valves covered by the evaluations in this report are for both Surry Power Station, Units 1 and 2, unless specifically identified otherwise.

Appendix A lists program inconsistencies and omissions, and identifies needed program changes.

1.1 IST Program Description

Virginia Electric and Power Company submitted Revision 0 of their Third Inspection Interval IST Program with a letter to the Nuclear Regulatory Commission (NRC) dated October 19, 1993. The IST program is dated October 19, 1993, and covers the third ten-year interval starting May 10, 1994, and ending May 10, 2004, for both Units 1 and 2. The licensee's program is based on the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (the Code), Section XI, 1989 Edition and the Code of Federal Regulations (CFR), 10 CFR 50.55a. This Edition of the Code prescribes that the pump and valve testing be performed in accordance with the requirements of the ASME/American National Standards Institute (ANSI) Operations and Maintenance (O&M) Standards Parts 6 and 10, respectively.

1.2 IST Requirements

10 CFR 50.55a(f), states that IST of certain ASME Code Class 1, 2, and 3 pumps and valves will be done according to the ASME Code, Section XI, Subsections IWP and IWV, except where the alternative is authorized or relief is granted by NRC in accordance with 10 CFR 50.55a(a)(3)(i), (a)(3)(ii), or (f)(6)(i). Virginia Electric and Power Company requests relief from the ASME Code testing requirements for specific pumps and valves. Certain of these requests are evaluated in this Technical Evaluation Report (TER) using the acceptance criteria of the Standard Review Plan, Section 3.9.6, NRC Generic Letter No. 89-04 (GL 89-04), "Guidance on Developing Acceptable Inservice Testing Programs," and 10 CFR 50.55a. Other requests in the licensee's IST program that are not evaluated in this TER, may be granted by provisions of GL 89-04 or include non-Code Class 1, 2, or 3 components.

In rulemaking to 10 CFR 50.55a effective September 8, 1992, (See 57 Federal Register 34666), the 1989 Edition of ASME Section XI was incorporated in 10 CFR 50.55a(b). The 1989 edition provides that the rules for IST of pumps and valves shall meet the requirements set forth in ASME/ANSI O&M Part 6 (OM-6), "*Inservice Testing of Pumps in Light-Water Reactor Power Plants*," and Part 10 (OM-10), "*Inservice Testing of Valves in Light-Water Reactor Power Plants*."

1.3 Scope and Limits of the Review

The scope of this review includes, but is not limited to, the cold shutdown justifications, refueling outage justifications, and relief requests for safety-related Code Class 1, 2, and 3 pumps and valves submitted with the licensee's IST program. Other portions of the program, such as general discussions, pump and valve test tables, etc., are not necessarily reviewed. Endorsement of these aspects of the program by the reviewer is not stated or implied.

The Safety Injection (SI), Reactor Feedwater, and Service Water (SW) Systems were specifically reviewed for scope and completeness of the licensee's IST program. The system drawings were reviewed and many valves evaluated to determine if they perform a safety-related function. Although this review was more detailed than normally performed, it was a spot check and does not constitute a comprehensive system review or endorsement of the licensee's scope. The spot check of the IST program plan and the piping and instrumentation drawings (P&IDs) for these systems did not reveal any omissions or other problems with the IST program.

The evaluations in this TER are applicable only to the components or groups of components identified by the submitted requests. Further, the evaluations and recommendations are limited to the requirement(s) and/or function(s) explicitly discussed in the applicable TER section. For example, the results of an evaluation of a request involving testing of the containment isolation function of a valve cannot be extended to allow the test to satisfy a requirement to verify the valve's pressure isolation function, unless that extension is explicitly stated.

2. PUMP TESTING PROGRAM

The following relief requests were evaluated against the requirements of ASME/ANSI OMa-1988, Part 6; 10 CFR 50.55a; and applicable NRC positions and guidelines. A summary is presented for the relief request followed by the licensee's basis for relief and the evaluation with the reviewers' recommendations. These relief request evaluations are for both Unit 1 and Unit 2 unless specifically identified otherwise. Where the pump numbers are the same other than the unit designation, the unit designation is shown as "1(2)," however, if there are other variations in the pump numbers, the numbers for Unit 2 are shown in parentheses.

2.1 General Pump Relief Requests

2.1.1 Reference Values for Vibration Velocity

2.1.1.1 Relief Request. P-1 requests relief from the pump vibration measurement reference value requirements of OM-6, Paragraph 4.3, for all pumps in the IST program. The licensee proposes to set the vibration velocity reference values for pumps with measured vibration velocities below 0.05 in/sec. at 0.05 in/sec..

2.1.1.1.1 Licensee's Basis for Requesting Relief--The following text is quoted from relief request P-1 in Revision 0 of the Surry Power Station, Units 1 and 2, third interval IST program submitted by letter dated October 19, 1993:

> Small reference values for vibration (V_r) will produce small acceptable ranges for pump operation. Based on a small acceptable range, an adequately and smoothly running pump could be subject to corrective action. To avoid this situation, a minimum value for V_r of 0.05 in/sec has been established for velocity measurements.
>
> Alternate Testing Proposed: Pumps with a measured reference value below 0.05 in/sec shall have subsequent test results compared to an acceptable range based on 0.05 in/sec.

2.1.1.1.2 Evaluation--The Code requires the establishment of reference values for vibration measurements. The Code provides acceptance criteria for vibration in both relative and absolute terms. A well-balanced pump may exhibit very low vibration levels following installation or maintenance. The industry and ASME Code committees have recognized a concern with using low reference values for smoothly running pumps as this might result in inoperability determinations at very low vibration levels. The ASME Task Group on Vibration is actively considering the reference value issue for smoothly-running pumps. Assigning minimum reference values, such as 0.05 in/sec and 0.075 in/sec. have been discussed in Committee, however, there is not yet a consensus on the correct solution. It is obvious that a multiple of a very small reference value of vibration (such as 0.01 in/sec.) could result in requiring action at what is generally considered a very low level of vibration (6 X 0.01 in/sec. = 0.06 in/sec.). That level is well below the absolute required action limit of 0.7 in/sec. or even the alert level of 0.325 in/sec.. Many new pumps experience vibration at levels higher than 0.06 in/sec.. An Electric Power Research Institute (EPRI) Report, EPRI GS-7406, *Vibration Sensor Mounting Guideline* found variations of up to 0.05 in/sec. in vibration readings made by several people with a hand held probe.

The licensee proposes to assign a minimum reference value of 0.05 in/sec. for any pump with a measured reference value of ≤0.05 in/sec.. This value of vibration velocity is generally indicative of a pump in excellent operating condition, particularly for pumps with speeds greater than 600 rpm. Values of pump vibration velocity that are 2.5 times higher than this reference value (in the alert range) are generally representative of pumps that are still in good operating condition. Values of pump vibration velocity which are 6 times higher than this reference value (in the required action range) are generally representative of pumps which are in fair operating condition. The assignment of a minimum vibration velocity reference value of 0.05 in/sec. should allow an adequate assessment of pump condition for an interim period until the Code Committee establishes appropriate guidance for setting minimum reference values for smoothly-running pumps. Requiring the licensee to assign very low reference values such as 0.01 in/sec., which are representative of the actual cyclic vibrational forces on the pump and are the result of good maintenance practices, may result in unneeded testing and maintenance on pumps that are in good operating condition and do not pose a threat to plant safety. This would impose a hardship on the licensee that would not be offset by a compensating increase in the level of quality and safety for most pumps.

However, there could be cases, such as for small pumps where the proposed reference values are not appropriate. So, prior to assigning the proposed minimum reference value, the licensee should review the application and the manufacturers' recommendations to ensure that the proposed minimum reference value is appropriate.

Another issue to consider is the mobility characteristic of the structure at the point where the vibration measurement is taken. Mobility is a measure of a structure's willingness to be set in motion by a force. The following formula shows the relationship of force and mobility to vibration:

Force x Mobility = Vibration

Given a certain level of cyclic vibrational force, if a vibration measurement is taken on an area of a pump with relatively low mobility, the measured vibration value will be low. That is, the magnitude of the measured value would be influenced (in this case, suppressed) by the low mobility of the machine at the measurement point. In this case, a low reference value of vibration velocity would be appropriate. The licensee should consider using the actual measured vibration level if low mobility is a problem.

Based on the determination that immediate compliance with the Code reference value requirements would constitute a hardship without a compensating increase in the level of quality and safety, we recommend that the alternative be authorized on an interim basis pursuant to 10 CFR 50.55a(a)(3)(ii) with the following provision. Prior to assigning the 0.05 in/sec. as a minimum reference value, the licensee should review each application and the manufacturers' recommendations to ensure that the proposed minimum reference value is appropriate. Once the OM Code Committee comes to a consensus and changes the Code with guidance for smoothly-running pumps, the licensee should adopt the guidance or develop and justify a reasonable alternative to the Code.

2.2 Residual Heat Removal System

2.2.1 Test Frequency

2.2.1.1 Relief Request. P-7 requests relief from the test frequency requirements of OM-6, Paragraph 5.1, for the residual heat removal (RHR) pumps, 1(2)-RH-P-1A and 1(2)-RH-P-1B. The licensee proposes to test these pumps during cold shutdowns, but not to exceed once every three months.

2.2.1.1.1 Licensee's Basis for Requesting Relief--The following text is quoted from relief request P-7 in Revision 0 of the Surry Power Station, Units 1 and 2, third interval IST program submitted by letter dated October 19, 1993:

> The low pressure RHR pumps take suction from and discharge to the reactor coolant system which operates nominally at 2235 psig. This is well above the operating pressure for the RHR pumps. Therefore, testing during normal operation is not possible.
>
> Alternate Testing Proposed: Pumps will be tested each cold shutdown (but not more frequently than every three months).

2.2.1.1.2 Evaluation--The Code requires pumps to be tested quarterly. However, these RHR pumps take a suction (the sole suction source) from and discharge to the reactor coolant system (RCS). The RHR pumps are in a standby condition during power operation and are not exposed to operational wear except when the RCS is at low pressure and the RHR system is operating. The RHR system is a low pressure system that would rupture if exposed to the normal operating RCS pressure of approximately 2150 psig. Also, the RHR motor-operated suction valves are interlocked and cannot be opened when the RCS is at normal operating pressure. Therefore, compliance with the Code test frequency requirements is impractical. Major plant and system modifications are needed to allow quarterly testing of the RHR pumps according to the Code requirements. These modifications would be costly and burdensome for the licensee. The licensee proposes to test the subject RHR pumps during cold shutdowns, but not more frequently than once every three months. This proposal to test these pumps during cold shutdowns provides a reasonable alternative to the Code.

Based on the determination that compliance with the Code test frequency requirements is impractical, that the proposed testing provides reasonable assurance of operational readiness, and considering the burden on the licensee if Code requirements were imposed, we recommend that relief be granted as requested pursuant to 10 CFR 50.55a(f)(6)(i).

2.3 Service Water System

2.3.1 Modified Pump Curve Testing

2.3.1.1 Relief Request. P-11 of the Unit 1 IST program requests relief from the reference value and differential pressure (d/p) measurement requirements of OM-6, Paragraphs 4.3 and 4.6.2.2, for the emergency service water pumps, 1-SW-P-1A, 1-SW-P-lB, and 1-SW-P-1C. The licensee proposes to conduct tests of these pumps within the tide level limits of a pump reference curve. The pump flow will be compared to acceptance criteria based on the reference curve and the ranges given in OM Part 6, Table 3b. Discharge pressure will not be measured.

2.3.1.1.1 Licensee's Basis For Requesting Relief--The following text is quoted from relief request P-11 in Revision 0 of the Surry Power Station, Unit 1, third interval IST program submitted by letter dated October 19, 1993:

> 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 OM Part 6, Table 3b.
>
> As stated above, the emergency service water pumps discharge into the intake canal. The end of the discharge pipe is above the level of the canal and the pressure at the end of the discharge pipe is always equal to the atmospheric pressure. Therefore, the total head and the corresponding flow will depend upon the tide level and will vary as the tide level varies. For purposes of testing, the system head is set by the tide level, and the corresponding measured flow will be compared to the acceptance criteria. Because the pressure at the end of the discharge piping is always equal to the atmospheric pressure and the flow varies as a function of tide level, there is no need to measure the discharge pressure at a point closer to the pump.
>
> Also, OM Part 6, Paragraph 4.6.2.2 states that differential pressure can be determined by the difference between the pressure at a point in the inlet pipe and the pressure at a point in the discharge pipe. In the case of the emergency service water pumps, the end of the discharge pipe can be considered the "point in the discharge pipe" where the discharge pressure is determined (i.e., atmospheric pressure). The inlet pressure is dependent on the tide level. Although the discharge pressure will not

be measured, the intent of Paragraph 4.6-2.2 is met and the test is equivalent to that described in Paragraph 4.6.2.2.

Alternate Testing Proposed: The flow is dependent upon tide level. Tests will be conducted within the tide level limits of the pump reference curve, and flow will be compared to acceptance criteria based on the reference curve and the ranges given in OM Part 6, Table 3b. Discharge pressure will not be measured.

2.3.1.1.2 Evaluation--The Code requires pump testing at reference values taken at points of operation that can be duplicated during subsequent testing. The pump speed is set (for variable speed pumps), the reference value of either flow rate [Q] or d/p is established, and the corresponding dependant variable of d/p or Q is measured and compared to the applicable acceptance criteria. This allows an assessment of changes in pump operational characteristics and the determination of operational readiness. The Code does not require measurement of discharge pressure.

The subject pumps are in an essentially fixed-resistance system. There are no installed provisions, such as throttle valves, for varying the system flow rate or d/p. The system has a variable inlet pressure or static head, which is due to the height of water above the pump suction. The inlet pressure varies slightly due to changes in the tide level of the James river. In relief request P-11, the licensee states that the ". . . pressure at the end of the discharge pipe is always equal to the atmospheric pressure. Therefore, the total head and the corresponding flow will depend upon the tide level and will vary as the tide level varies." Actually, the pressure in the discharge pipe must exceed atmospheric pressure or there would be no flow out of the pipe and into the bay. Closed fluid systems analysis techniques are not applicable once the fluid exits the pipe. The fluid pressure and velocity at the discharge point are essentially converted to kinetic energy which carries the fluid stream some distance into the open discharge bay. Changes in the pump's inlet pressure would be reflected by a shift in the pump's system curve. The pump operates at the point of intersection of the pump and system curve. Therefore, variations in inlet pressure would cause the pump to operate at somewhat different points on the pump curve. The more vertical the system curve, the less change in the intersection point. However, pump d/p will also vary with degradation, such as fouling by marine growth, or wear of the pump internals, such as the impeller. As the d/p across the pump increases or decreases the pump Q will also increase or decrease. The licensee should consider these effects in the analysis of these pumps' operational readiness.

The licensee also states that ". . . there is no need to measure the discharge pressure at a point closer to the pump." and that " . . . Although the discharge pressure will not be measured, the intent of Paragraph 4.6-2.2 is met and the test is equivalent to that described in Paragraph 4.6.2.2." The pump's discharge pressure does not equal atmospheric pressure as implied above. Therefore, the licensee's proposed method does not appear to meet the intent of Paragraph 4.6.2.2 for determining d/p.

The licensee proposes to test these pumps using a reference curve. The acceptance criteria of OM-6, Table 3b, will be applied to the measured Q. Traditional pump hydraulic performance curves are developed based on the relationship between pump head (or d/p) and

Q, which are usually measured at several points of operation. Commonly, d/p is given on the y-axis and Q is on the x-axis of the plot. Degradation in pump hydraulic performance is seen as a downward shift in the pump curve. Usually the shift is greater at higher Qs. When the degraded pump is tested, the operator varies the system resistance to achieve the reference d/p (or Q) and measures the other parameter, Q or d/p. The Q varies as the resistance is adjusted to the reference point of d/p. Degradation is seen as a change in Q from the reference value. Establishing a reference curve for a pump when it is known to be operating acceptably, and basing the acceptance criteria on this curve, can permit evaluation of pump condition and detection of degradation. There is, however, a higher degree of uncertainty associated with using a curve to assess operational readiness. Therefore, the development of the reference curve should be as accurate as possible. Additionally, when using reference curves, it may be more difficult to identify instrument drift or to trend changes in component condition.

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 five.
d. Points are beyond the "flat" portion (low flow 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 Specification (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.

However, traditional curve testing does not appear to be feasible in this case, as this is a fixed-resistance system with no provision for varying d/p or Q. Except as affected by degradation, the licensee's pumps should always be operating at fixed points of d/p and Q. As the pump's ability to develop head (d/p) degrades, the Q through the pump will also degrade. Given that traditional curve testing may not be appropriate, and considering the limited information provided in the relief request regarding the licensee's approach to curve testing, the reviewer cannot fully assess the proposal and determine whether relief should be granted or the alternative authorized as provided for in 10 CFR 50.55a. Therefore, long term relief should not be granted. However, since the licensee cannot vary the resistance of this system, immediate compliance with the Code is impractical. Requiring the licensee to modify the system to comply with the Code would likely result in an extended shutown and would be burdensome. The licensee's proposed testing, to monitor the Q through the system and measure pump vibration, gains information that can be considered to assess the operational readiness of these pumps. Therefore, their proposal provides an adequate alternative to the Code requirements for an interim period of one year or until the next refueling outage, whichever is longer. At the end of that period, the licensee should either comply with the Code or develop and implement a method of monitoring the condition of these pumps that provides a reasonable alternative to the Code.

Based on the determination that immediate compliance with the Code is impractical and burdensome, and considering the licensee's proposal, we recommend that interim relief be authorized pursuant to 10 CFR 50.55a(f)(6)(i) for a period of one year or until the next refueling outage, whichever is longer. Relief should not be granted beyond that point. By the end of that period the licensee should either comply with the Code or develop and implement a method of monitoring the condition of these pumps that provides a reasonable alternative to the Code.

2.4 Main Control Room Air Conditioning

2.4.1 Determination of Flow Rate and Modified Acceptance Criteria

2.4.1.1 Relief Request. P-16 of the Unit 1 IST program requests interim relief from the requirements of OM-6, Paragraphs 4.3 and 4.6.2.2 to measure and evaluate Q, for the main control room (MCR) air conditioning pumps, 1-VS-P-1A, 1-VS-P-1B, and 1-VS-P-1C. The licensee proposes to determine pump Q by measuring the d/p across the chiller condensers. The alert value will be set at 10% above the minimum Q (240 gpm) or 264 gpm, which equates to a d/p of 4 psid. The pump will be declared inoperable if a d/p of at least 3.5 psid (which equates to 240 gpm) cannot be achieved via system adjustments. Additionally, if a pump discharge pressure of at least 30 psig cannot be achieved with a shut backwash valve, the system and pump will be investigated. Inlet pressure and Q measuring instruments will be installed by the end of the Unit 1, cycle 12 refueling outage, which is scheduled for the second quarter of 1994. Once the modifications are made, the licensee will comply with the Code requirements.

2.4.1.1.1 Licensee's Basis For Requesting Relief--The following text is quoted from relief request P-16 in Revision 0 of the Surry Power Station, Unit 1, third interval IST program submitted by letter dated October 19, 1993:

> No flow or inlet pressure instrumentation is installed. According to Technical Specification Paragraph 3.23.C.1.b, "If one chiller becomes inoperable, return the inoperable chiller to operable status within seven (7) days or bring both units to Hot Shutdown within the next six (6) hours and be in Cold Shutdown within the following 30 hours." Because the main control and emergency switchgear room emergency ventilation system is common for both units, the above action statement applies whenever Unit 1 or Unit 2 is operating.

Given the scope of the required instrumentation modifications and the existing system configuration, it is estimated that installation of the appropriate flow and pressure instrumentation cannot be completed within the Technical Specification 7 day action statement. Two additional Main Control Room and Emergency Switchgear Room Air Conditioning System chillers are scheduled for installation by the end of 1993. The additional chillers will eliminate the need for entry into the Technical Specification action statement to install the instrumentation. Also, the flow elements for the chiller service water pumps cannot be installed at power. Therefore, installation of the additional instrumentation is scheduled to be completed by the end of the Unit 1 Cycle 12 refueling outage currently scheduled for second quarter of 1994.

Interim Alternate Testing Proposed: The control room chillers are monitored at least once every quarter for adequate performance. Part of this surveillance verifies that minimum service water flow requirements are being met by the pumps. A flow rate of 240 gpm is the minimum required service water flow for condenser operability. The minimum flow is verified by measuring the differential pressure across the chiller condensers. The normal operating range is 4 to 7 psid across the chiller condensers. An alert value has been 10% above the minimum flow or 264 gpm. This flow equates to a differential pressure of 4 psid. If a differential pressure of at least 3.5 psid (240 gpm) cannot be achieved after any adjustments (i.e., adjusting the backwash valve and cleaning the service water pump Y-strainer) then the pump is declared inoperable.

When differential pressure exceeds 7 psid, the condenser tubes require cleaning. Also, if a pump discharge pressure of 30 psig cannot be achieved with a fully shut backwash isolation valve, then an investigation is initiated to check for possible upstream restriction or a degraded pump. Vibration monitoring has been added to the surveillance and will be performed at least once every quarter. The acceptance criteria for vibration are based upon the Section XI program.

The correlation between condenser differential pressure and flow was established during special tests that were conducted in June of 1989. The special tests consisted of fabricating a temporary instrumented loop of pipe with a straight run long enough to produce stable flow. The permanent piping has no straight runs that are long enough to measure flow. A section of permanent pipe was removed and the temporary section installed. The results of the tests are given in Figure 1 and Table 1.

Inlet pressure and flow instrumentation installation will be completed by the end of the Surry Unit I Cycle 12 refueling outage, currently scheduled for the second quarter of 1994. As the instrumentation is installed, inlet pressure, differential pressure, flow and vibration will be measured at least once every three months in accordance with ASME Section XI requirements.

FIGURE 1
FLOW VERSUS CONDENSER DIFFERENTIAL PRESSURE

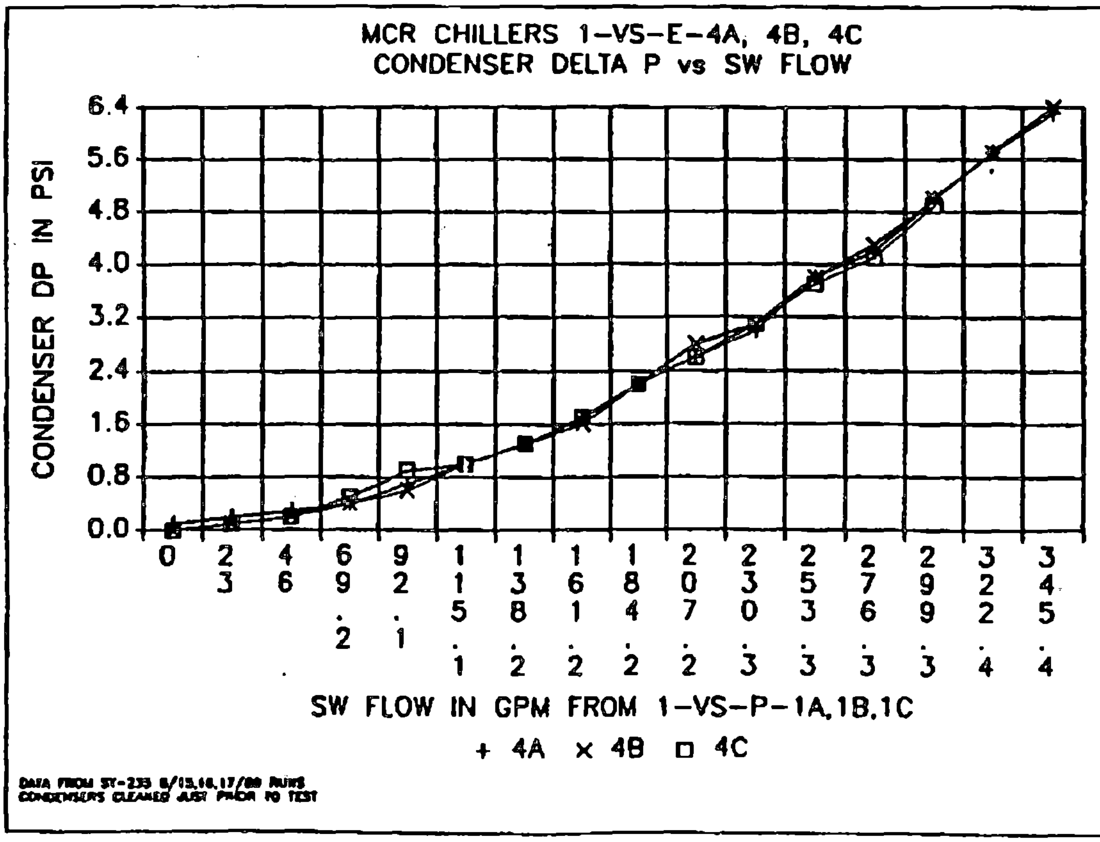

TABLE 1
FLOW VERSUS CONDENSER DIFFERENTIAL PRESSURE

SPECIAL TEST ST-235, RUN 6/15 THRU 17/89 MCR CHILLERS 3-VS-E-4A, 4B, AND 4C

FLOW RATES		CONDENSER DP IN PSI		
FPS	GPM	E-4A	E-4B	E-4C
0.0	0.0	0.1	0.0	0.0
1.0	23.0	0.2	0.1	0.1
2.0	46.0	0.3	0.2	0.2
3.0	69.2	0.4	0.4	0.5
4.0	92.1	0.7	0.6	0.9
5.0	115.1	1.0	1.0	1.0
6.0	138.2	1.3	1.3	1.3
7.0	161.2	1.7	1.6	1.7
8.0	184.2	2.2	2.2	2.2
9.0	207.2	2.6	2.8	2.6
10.0	230.3	3.0	3.1	3.1
11.0	253.3	3.8	3.8	3.7
12.0	276.3	4.2	4.3	4.1
13.0	299.3	5.0	5.0	4.9
14.0	322.4	5.7	5.7	
15.0	345.4	6.3	6.4	

2.4.1.1.2 Evaluation--The Code requires measurement of pump d/p and Q during quarterly pump testing. The Code states alert and required action ranges for these test parameters in Tables 3a and 3b. These chilled water pumps provide cooling flow to the MCR and are not equipped with instruments to measure either inlet pressure or Q. Therefore, direct measurement of these parameters is impractical. The MCR ventilation system is common to both plants. Installation of flow rate instruments would require an extended system downtime, which would likely exceed the TS allowable outage time for the system and would be burdensome to the licensee. The licensee will add two additional chillers to the system by the end of 1993. This change will eliminate the need to enter an action statement to install instruments. Instruments for measuring inlet pressure and Q will be installed during an upcoming refueling outage, which is scheduled for early 1994.

The licensee has established the relationship between the d/p across the MCR chillers and the system Q and proposes to determine Q from chiller d/p measurements. This should allow a reasonable alternative to the Code and allow an accurate determination of system Q provided there is no significant fouling of the heat exchangers. Acceptance criteria will be applied to the results of tests as follows: The pump will be declared inoperable if a Q of 240 gpm (3.5 psid across the chiller) cannot be established through the system. The alert range will correspond to the d/p associated with a Q of 264 gpm, which is 10% above the required action level for Q (240 gpm). The licensee's Table 1 (preceding) indicates that the subject pumps are capable of Qs of up to 345 gpm. This Q exceeds the proposed acceptance criteria for the alert range by 81 gpm (30.7%). It exceeds the required action level by 105 gpm (43.8%). The licensee's proposed acceptance criteria for hydraulic performance seems to be based on the MCR chiller system functional requirements and not on the pump's characteristics. The licensee's acceptance criteria may not be sensitive to degradation in pump performance characteristics, but will take action only if the pump is inoperable and unable to perform its safety function. The licensee's proposal gets some information about pump condition and provides an adequate alternative to the Code requirements for an interim period. Yet, the proposal does not provide a reasonable long-term alternative to the Code test method requirements.

Based on the determination that compliance with the Code is impractical and burdensome, and considering the licensee's proposal, we recommend that interim relief be authorized pursuant to 10 CFR 50.55a(f)(6)(i) for a period of one year or until the next refueling outage, whichever is longer. Relief should not be granted beyond that point. By the end of that period the licensee should either comply with the Code or develop and implement a method of monitoring the condition of these pumps that provides a reasonable alternative to the Code.

2.4.2 Modified Pump Curve Testing

2.4.2.1 Relief Request. P-17 of the Unit 1 IST program requests interim relief from the requirements of OM-6, Paragraph 4.3, to obtain reference values at repeatable points of operation for the MCR air conditioning system chilled water circulating pumps, 1-VS-P-2A, 1-VS-P-2B, and 1-VS-P-2C. The licensee proposes to use a straight line approximation method to determine d/p reference points as a function of flow between the two test points. The measured d/p will be compared to the upper required action limit which is set at 110%

of the reference d/p (P_{rdiff}), and the lower required action limit at 90% of P_{rdiff}. No alert range will be assigned.

2.4.2.1.1 Licensee's Basis For Requesting Relief--The following text is quoted from relief request P-17 in Revision 0 of the Surry Power Station, Unit 1, third interval IST program submitted by letter dated October 19, 1993:

> The chilled water circulating pumps for the main control room air conditioning system service two trains each with of 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.
>
> Alternate Testing Proposed: Two reference points of total flow versus differential pressure will be established from the reference test for each pump. A straight line approximation will be used to determine differential pressure reference points as a function of flow between the two test points. By keeping the difference between two test points small (a difference of 30 gpm compared to a nominal reference value of 270 gpm), the straight line is a good approximation of the pump curve within the two test points. During the subsequent tests, flow will be throttled in each parallel path as close as practical to a reference flow value for that path. The total flow must fall between the two reference points used to establish the straight line approximation. The total flow and the corresponding differential pressure will be compared to either graphical and/or tabular acceptance criteria based on the straight line approximation of the reference pump curve.
>
> For example, given the straight line equation determined from the two reference points for flow and differential pressure:
>
> P_{rdiff} = a + b*Q where
>
> P_{rdiff} = the reference differential pressure based on the test value for flow (Q) recorded during subsequent tests and, a and b are constants,
>
> The acceptance criteria for the flow (Q) would be as follows:
>
> Upper Required Action = $1.1*P_{rdiff}$
> Lower Required Action = $0.90*P_{rdiff}$
>
> The multipliers on P_{rdiff} are taken from OM Part 6, Table 3b. The actual recorded differential pressure (P_{adiff}) will then be compared to the acceptance criteria determined from P_{rdiff}. Also, the test results can be trended from test to test by normalizing P_{adiff} to P_{rdiff}. For acceptable operation, the ratio of P_{adiff}/P_{rdiff} must fall

between 0.9 and 1.1. A decrease in the ratio from test to test would indicate a steady degradation in pump performance.

2.4.2.1.2 Evaluation--OM-6, Paragraph 5.2(b) requires that the system resistance be varied to establish a reference d/p or Q and that the other parameter be measured and compared to its reference value. Evaluating Q and d/p against their reference values permits assessment of pump hydraulic condition and detection of degradation. These chiller pumps are connected to parallel trains each consisting of four chillers. The system Q is spread between four loads and must be calculated by totaling the four load Qs. Adjustment of Q during tests is accomplished via throttling a gate valve near each air handling unit. The Q through a gate valve varies in a non-linear fashion with changes in the disk position. This is due to flow instabilities, such as cavitation and vibration of the disk caused by the changing geometry of the opening. This makes it difficult to attain a specific reference point, which makes compliance with the Code requirements impractical. The system would have to be redesigned and modified to allow accurate adjustment of Q to an established reference value. Those modifications would be burdensome to the licensee.

The licensee proposes to use a modified pump curve test to monitor these pumps for degradation. The proposed method and acceptance criteria are described in the preceding. The proposal employs a straight line approximation method to approximate the pump curve between two closely-spaced points (30 gpm difference between the points with a nominal reference of 270 gpm). The licensee will perform corrective actions if the d/p varies from the reference d/p by ±10%. The licensee has not assigned an alert range. Q will be measured during the test and the corresponding d/p from the approximation will be compared to the measured d/p and the difference evaluated against the acceptance criteria. The licensee's proposal appears to be a reasonable approach to their situation, given the difficulty of achieving a specific reference value. However, insufficient information provided in the submittal to fully assess the technique and determine its acceptability relative to the 10 CFR 50 criteria.

The shape of the pump curve over the range of the straight line approximation will affect the appropriateness of the acceptance criteria. Pump curves are generally relatively flat at low Qs and convex downward at higher Qs. However, some can be relatively flat or even convex upward at higher Qs. For any shape of curve, the acceptance criteria at the endpoints will be the most accurate, however, for a convex downward curve, the acceptance criteria based on the straight line will be generally less conservative than at the actual reference points.

In this case, the reviewers conclude that it is impractical to test at a specific reference value of Q or d/p, testing in the "as found" condition and comparing values to an established reference curve may be an acceptable alternative. Pump curves represent an infinite set of reference points of Q and d/p. Establishing a reference curve for a pump when it is known to be operating acceptably, and basing the acceptance criteria on this curve, can permit evaluation of pump condition and detection of degradation. There is, however, a higher degree of uncertainty associated with using a curve to assess operational readiness. Therefore, the development of the reference curve should be as accurate as possible.

Additionally, when using reference curves, it may be more difficult to identify instrument drift or to trend changes in component condition.

As-found testing using a reference curve may be the only practical alternative to the Code requirements. This testing can be acceptable if elements (a) through (g) listed in section 2.3.1.1.2 of this report are incorporated into the IST program and procedures for developing and implementing the curve(s).

Based on the determination that establishing the reference Q or d/p is impractical and burdensome during quarterly testing, and considering that measuring as-found conditions and using reference curves to evaluate these parameters can permit an adequate assessment of pump operational readiness, relief should be granted from this Code requirement pursuant to 50.55a(f)(6)(i) with the following provision. The licensee should follow the seven guidelines for using reference curves, if practicable. Where it is not practicable to follow these guidelines, the licensee should identify the specifics of their alternative and justify the deviations and show the adequacy of their proposed testing.

2.5 Component Cooling System

2.5.1 Modified Pump Curve Testing

2.5.1.1 Relief Request. P-19 of the Unit 1 IST program and P-16 of the Unit 2 IST program request interim relief from the requirements of OM-6, Paragraph 4.3 to measure flow and differential pressure at repeatable points of operation, for the component cooling pumps, 1-CC-P-1A, 1-CC-P-1B, 1-CC-P-1C, and 1-CC-P-1D. The licensee proposes to use a straight line approximation method to determine d/p reference points as a function of flow between the two test points. The measured d/p will be compared to the upper required action limit, which is set at 110% of P_{rdiff}, and the lower required action limit at 90% of P_{rdiff}. No alert range will be assigned.

2.5.1.1.1 Licensee's Basis For Requesting Relief--The following text is quoted from relief request P-19 (for Unit 1) and P-16 (for Unit 2) in Revision 0 of the Surry Power Station, third interval IST program submitted by letter dated October 19, 1993:

> 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.
>
> Alternate Testing Proposed: Two reference points of flow versus differential pressure will be established from the reference test for each pump. A straight line approximation will be used to determine differential pressure reference points as a function of flow between the two test points. By keeping the difference between two test points small, the straight line is a good approximation of the pump curve within the two test points. During the subsequent tests, test flow will be throttled as close as practical to the reference flow value. The test flow must fall between the two

reference points used to establish the straight line approximation. The test flow and the corresponding differential pressure will be compared to either graphical and/or tabular acceptance criteria based on the straight line approximation of the reference pump curve. For example, given the straight line equation determined from the two reference points for flow and differential pressure:

P_{rdiff} = $a + b*Q$ where

P_{rdiff} = the reference differential pressure based on the test value for flow (Q) recorded during subsequent tests and, a and b are constants,

The acceptance criteria for the flow (Q) would be as follows:

Upper Required Action = $1.1*P_{rdiff}$
Lower Required Action = $0.90*P_{rdiff}$

The multipliers on P_{rdiff} are taken from Table 3b in OM Part 6. The actual recorded differential pressure (P_{adiff}) will then be compared to the acceptance criteria determined from P_{rdiff}. Also, the test results can be trended from test to test by normalizing P_{adiff} to P_{rdiff}. For acceptable operation, the ratio of P_{adiff}/P_{rdiff} must fall between 0.9 and 1.1. A decrease in the ratio from test to test would indicate a steady degradation in pump performance.

2.5.1.1.2 Evaluation--OM-6, Paragraph 5.2(b) requires that the system resistance be varied to establish a reference d/p or Q and that the other parameter be measured and compared to its reference value. Evaluating Q and d/p against their reference values permits assessment of pump hydraulic condition and detection of degradation. The component cooling water system supplies dozens of independent loads. The system Q is adjusted during tests via throttling of a butterfly valve. Butterfly valves are generally most sensitive in the 15 to 70° open position, however, severe throttling may lead to cavitation. This design limitation may make it difficult to attain a specific reference point. The difficulty in achieving a single fixed value of Q makes compliance with the Code requirements impractical. The system would have to be redesigned and modified to allow accurate adjustment of Q to an established reference value. Those modifications would be burdensome to the licensee.

The licensee proposes to use a modified pump curve test to monitor these pumps for degradation. The proposed method and acceptance criteria are described in the preceding. The proposal employs a straight line approximation method to approximate the pump curve between two closely-spaced points. The licensee will perform corrective actions if the d/p varies from the reference d/p by ±10%. The licensee has not assigned an alert range. Q will be measured during the test and the corresponding d/p from the approximation will be compared to the measured d/p and the difference will be evaluated against the acceptance criteria. The licensee's proposal appears to be a reasonable approach to their situation, given the difficulty of achieving a specific reference value. However, insufficient information provided in the submittal to fully assess the technique and determine its acceptability relative to the 10 CFR 50 criteria.

The distance between endpoints and the shape of the pump curve over the range of the straight line approximation will affect the appropriateness of the acceptance criteria. Pump curves are generally relatively flat at low Qs and convex downward at higher Qs. However, some can be relatively flat or even convex upward at higher Qs. For any shape of curve, the acceptance criteria at the endpoints will be the most accurate, however, for a convex downward curve, the acceptance criteria based on the straight line will be generally less conservative than at the actual reference points.

In this case, the reviewers conclude that it is impractical to test at a specific reference value of Q or d/p, testing in the "as found" condition and comparing values to an established reference curve may be an acceptable alternative. Pump curves represent an infinite set of reference points of Q and d/p. Establishing a reference curve for a pump when it is known to be operating acceptably, and basing the acceptance criteria on this curve, can permit evaluation of pump condition and detection of degradation. There is, however, a higher degree of uncertainty associated with using a curve to assess operational readiness. Therefore, the development of the reference curve should be as accurate as possible. Additionally, when using reference curves, it may be more difficult to identify instrument drift or to trend changes in component condition.

As-found testing using a reference curve may be the only practical alternative to the Code requirements. This testing can be acceptable if elements (a) through (g) listed in Section 2.3.1.1.2 of this report are incorporated into the IST program and procedures for developing and implementing the curve(s).

Based on the determination that establishing the reference Q or d/p is impractical and burdensome during quarterly testing, and considering that measuring as-found conditions and using reference curves to evaluate these parameters can permit an adequate assessment of pump operational readiness, relief should be granted from this Code requirement pursuant to 50.55a(f)(6)(i) with the following provision. The licensee should follow the seven elements identified in the preceding paragraph for using reference curves, if practicable. Where it is not practicable to follow these guidelines, the licensee should identify the specifics of their alternative and justify the deviations and show the adequacy of their proposed testing.

2.6 Chemical and Volume Control System

2.6.1 Instrument Range and Accuracy

2.6.1.1 Relief Request. P-18 of the Unit 1 and P-21 of the Unit 2 IST program request interim relief from the instrument accuracy and full-scale range requirements of OM-6, Paragraph 4.6.1.1 and 4.6.1.2, for the chemical and volume control pumps, 1-CH-P-2A, 1-CH-P-2B, 1-CH-P-2C, and 1-CH-P-2D. The licensee proposes to use inlet pressure gauges with a full-scale range of 0 to 15 psig and calibrated to an accuracy of $\pm 3\%$. The loop accuracies for the discharge pressure gauges will be maintained to ensure that the d/p error is below that allowed by the Code.

2.6.1.1.1 Licensee's Basis For Requesting Relief--The following text is quoted from relief requests P-18 (Unit 1) and P-21 (Unit 2) in Revision 0 of the Surry Power Station, third interval IST program submitted by letter dated October 19, 1993:

> 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. Also, 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 OM Part 6, Paragraph 4.6.1.2. 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 overrange 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%.
>
> Alternate Testing Proposed: The inlet pressure gauges with a full scale range of 0 to 15 psig and calibrated to an accuracy within ±3%, will be used to measure dynamic inlet pressures. Also, the loop accuracies for the discharge pressure gauges will be maintained at or below an accuracy of 1.75% to ensure that the differential pressure error is below the differential pressure error allowed by the Code.

2.6.1.1.2 Evaluation--The Code specifies that the full-scale range of each instrument shall be three times the reference value or less and an accuracy of ±2% of full-scale. The intent of the Code requirements for range and accuracy of instrumentation for measuring Q and pressure were established so that readings obtained would be within a range of variance small enough to make degradation monitoring meaningful. The inlet pressure to these boric acid transfer pumps varies significantly between the standby and operating modes. Static inlet pressure available to these pumps is 6 to 7 psig, however, when the pumps are operating, the inlet pressure drops to about 2 psig. An inlet pressure gage that meets the three times the reference value requirement would have a range of 0 to 6 psig. However, the static inlet pressure would overrange the gage and possibly damage it.

The licensee proposes to use inlet pressure gauges with a full-scale range of 0 to 15 psig calibrated to ±3%. The licensee will maintain the loop accuracies for the discharge pressure at or below 1.75% to keep the d/p percentage of deviation below the percentage of deviation allowed by the Code.

The NRC does not consider the installation or replacement of instruments an undue burden, however, if the available instrumentation meets the intent of the Code requirements for the actual reading, the use of instrumentation provides an equivalent level of quality and safety for IST. Therefore, since the licensee's proposal provides an equivalent level of quality and safety, we recommend that the proposed alternate be authorized pursuant to 10CFR50.55a(a)(3)(i).

3. VALVE TESTING PROGRAM

The following relief requests are evaluated against the requirements of the 1987 Edition, 1988 Addenda, of the O&M Code, Part 10; 10 CFR 50.55a; and applicable NRC positions and guidelines. A summary and the licensee's basis for each relief request is presented followed by an evaluation and the reviewer's recommendation. Relief requests are grouped according to system and Code Category. These relief request evaluations are for both Unit 1 and Unit 2 unless specifically identified otherwise. Where the valve numbers are the same other than the unit designation, the unit designation is shown as "1(2)," however, if there are other variations in the valve numbers, the numbers for Unit 2 are shown in parentheses.

3.1 Various Systems

3.1.1 Stroke Time Measurements for Certain Power Operated Valves

3.1.1.1 Relief Request. V-47 requests relief from the stroke time measurement method and acceptance criteria requirements of OM-10, Paragraphs 1.3 and 4.2.1.8, for the valves listed in Table V-47 of the relief request. The licensee proposes to measure the stroke times of these valves by observing the valve stems locally. In addition, the acceptance criteria of Paragraph 4.2.1.8 will not be applied.

3.1.1.1.1 Licensee's Basis For Requesting Relief--The following text is quoted from relief request V-47 in Revision 0 of the Surry Power Station, Units 1 and 2, third interval IST program submitted by letter dated October 19, 1993:

> The valves listed in Table V-47 either have no remote indication and no remote control, or no remote open/close control, or the test requires that the power source be interrupted at the valve and not at the switch. Also, these valves typically exhibit stroke time data scatter from test to test that can exceed the 25% and 50% required by Paragraphs 4.2.1.8(b) and (d). Therefore, timing the full-stroke from the initiation of the actuating signal and applying the acceptance criteria of Paragraphs 4.2.1.8(b) and (d) are not practical.
>
> Valve 1-CC-LCV-101 (2-CC-LCV-201) maintains the water level in the seal cooling water tank for component cooling to charging pump cooling system. This valve has no remote indication or manual position switch. The valve is exercised by manipulating the tank level signal and isolating the power source, and timed by locally observing stem movement. Differences in interpreting when the valve stem starts and stops will affect the repeatability of the stroke time measurements.
>
> The position of valves 1-MS-RV-101A, B and C (2-MS-RV-201A, B and C) is controlled by a potentiometer. Although the valves have remote position indication, there is no open/closed switch. The speed at which the valve goes open or closed depends upon the speed at which the operator turns the potentiometer knob, which in turn affects the repeatability of the stroke time measurements.

Valves 1-RH-FCV-1605 (2-RH-FCV-2605) and 1-RH-HCV-1758 (2-RH-HCV-2758) are controlled by a potentiometer and have no remote indication. The stroke time is measured by locally observing stem movement. Differences in interpreting when the valve stem starts and stops affect the repeatability of the stroke time measurements.

Valves 1-SW-PCV-100A, B and C, and 1-SW-PCV-101A, B and C have no remote indication or manual remote control. The valve position is manipulated by venting the actuator diaphragm and the stroke time is measured by observing the movement of the local position indicator. Differences in the speed at which the petcock is opened to vent the diaphragm and in interpreting when the position indicator starts and stops affect the repeatability of the stroke time measurements.

Valves 1-SW-TCV-108A, B and C (2-SW-TCV-208A, B and C) control the flow of service water to the charging pump lube oil coolers. There is no remote indication or manual position switch. Valve position is controlled by lube oil temperature. The valves are locally manipulated by isolating the power source, and timed by observing stem movement. Differences in interpreting when the valve stem starts and stops affect the repeatability of the stroke time measurements.

Alternate Testing: The full-stroke will be measured by locally observing stem movement and not from the initiation of the actuating signal. Also, maximum stroke times will be established in accordance with Paragraph 4.2.1.9(a). However, the ranges described in Paragraphs 4.2.1.8(b) and (d) will not be applied.

3.1.1.1.2 Evaluation--The Code requires measurement of the full-stroke times of power-operated valves as they are exercised at the Code prescribed frequency. These measurements are compared to the limiting values of full-stroke times and the reference stroke times to monitor for valve degradation. Evaluating valve stroke times against limits and reference values can allow detection of significant degradation and performance of corrective actions prior to catastrophic valve failure. The licensee proposes to measure valve stroke times by direct observation of the stems of the subject valves. These valves would also be excluded from the requirement to compare the measured stroke times to reference values. The stroke times of these valves will only be compared to their limiting values of full-stroke times.

The Code requires that the full-stroke times of power operated valves be measured from the initiation of the actuating signal to the indication of the end of the operating stroke. To perform this testing by conventional means, a valve must have an open/close switch (that will cause the valve to move from its fully-open position to the fully-closed position and/or from the closed position to the open position) and remote position indication. The subject valves lack one or both of these items, which makes it impractical to measure their full-stroke times by conventional means. Some of the valves can be positioned only by adjusting controller setpoints or a positioning potentiometer. System modifications would be necessary to permit conventional stroke timing of these valves. Performing the modifications needed to meet the Code requirements would be burdensome to the licensee.

The licensee's proposed testing provides a relatively inaccurate measurement of valve stroke times. Variations are introduced into the measurements when starting based on visual observation of stem movement and when stopping the measurement based on visually determining when the stem stops. The measurements are sufficiently inaccurate that applying the acceptance criteria of OM-10, Paragraph 4.2.1.8, could cause unnecessary retesting or declaring inoperable valves that are in good operating condition. The measurement inaccuracies and relaxed acceptance criteria decrease the likelihood of detecting degradation unless the valve is sufficiently degraded that the limiting value of full-stroke time is exceeded. Frequently, the limiting values of full-stroke time are assigned based on system operational requirements or limits and not on the valve size and type. This could lead to limits that are significantly higher than the valve reference stroke times. With stroke time limits significantly above reference values, most valves would fail long before the stroke time could increase to the limit. Therefore, the stroke testing could only detect valve failure, degradation could not be detected and acted upon.

Position 5 of GL 89-04 provides guidance for developing limiting values of full-stroke times for power-operated valves. It states in part, "The limiting value of full-stroke time should be based on the valve reference or average stroke time of a valve when it is known to be in good condition and operating properly." If the limiting values of full-stroke time are set according with this position, the proposed testing may allow detection of valve degradation. However, if these limits are not set in accordance with these guidelines, the proposed testing is incapable of detecting degradation and is unacceptable.

It is unclear from the licensee's submittal if alternative methods of stroke timing these valves have been considered. If not already done, the licensee should investigate alternate testing methods that could provide more accurate measurements of stroke times for these valves. These methods could range from procedural changes (e.g., removing a power source to a controller or using calibration equipment to insert a signal that would cause a valve to move to its open or closed position at maximum speed) to using nonintrusive diagnostics to measure the stroke times (e.g., using a hall-effect probe or gauss detector to detect when current is interrupted to a solenoid valve coil and detect when the slug has moved from the seat into the coil). This testing may only be practical during cold shutdowns or refueling outages. The licensee should perform this investigation and if a more accurate test method is found to be practicable, it should be employed to test the applicable valves. If an alternate method is not practicable and the proposed method is used, the limiting values of full-stroke times should be set in accordance with GL 89-04, Position 5, so that the testing can detect degradation short of valve failure.

Valve diagnostic programs can yield significant information about the valve assembly, including the valve and actuator. When meaningful inservice testing is impractical, a periodic verification performed using valve diagnostic techniques may be an adequate alternative method for monitoring these valves for degrading conditions. Because the testing addresses much more than only measuring the valve stroke times, the additional information obtained on the condition of the valves could be used to justify extending the test interval for performing diagnostic testing. Therefore, this alternative can ensure an acceptable level of quality and safety if the licensee has an established program of periodic diagnostic testing.

Based on the impracticality and burden of meeting the Code requirements for the subject valves and considering the acceptability of testing these valves by direct observation of the valve stems, we recommend that relief be granted from the Code requirements pursuant with 10CFR50.55a(f)(6)(i) with the following provisions. The limiting values of full-stroke times must be set in accordance with GL 89-04, Position 5, so that the testing can detect degradation short of valve failure. In addition, if not already done, the licensee should investigate alternate testing methods that could provide more accurate measurements of stroke times or other means of evaluating valve condition for these valves. If a more accurate or informative test method is found to be practicable, it should be employed to test the applicable valves.

3.1.2 Containment Isolation Valve Corrective Actions

3.1.2.1 Relief Request. V-51 requests relief from the leak rate test corrective action requirements of OM-10, Paragraph 4.2.2.3(f), for all of the containment isolation valves (CIVs) in the IST program. The licensee proposes to allow an evaluation of CIV leakage rates that are above the allowable leakage limits for individual valves as long as the overall containment leakage is less than $0.6L_a$. If the evaluation indicates that the containment leakage rate will remain below $0.6L_a$ until the next Type C tests, the licensee proposes that the valve with the high leakage rate need not be repaired or replaced.

3.1.2.1.1 Licensee's Basis For Requesting Relief--The following text is quoted from relief request V-51 in Revision 0 of the Surry Power Station, Units 1 and 2, third interval IST program submitted by letter dated October 19, 1993:

> Permissible valve leakage rates are based on each valve's possible contribution to the total leakage rate for the containment system. The total containment leakage rate must be less than $0.6L_a$ as defined in Technical Specification 4.4.C. Exceeding an individual valve's permissible leakage rate may have no affect on the containment's ability to maintain an overall leakage rate less than $0.6L_a$. Also, there may be plant conditions, or schedule constraints, that preclude repair or replacement of a valve when the individual leakage limit is exceeded, but the overall leakage limits for the Type C-tested valves is met. In these cases, imposing the Code requirements of repair or replacement would create an undue burden with no compensating benefit to quality and safety when the bases for leakage limits is met for the overall limit necessary to ensure containment integrity.
>
> Alternate Testing: In addition to repair or replacement as corrective actions, an evaluation can be performed which demonstrates that even if a valve has exceeded its permissible leakage rate, the overall containment leakage rate will be maintained below $0.6L_a$ until the next Type C tests. No repair or replacement is necessary if the evaluation is performed. However, when the plant conditions are not such that a repair or replacement would adversely impact plant startup and/or continued operations, an evaluation is not appropriate.

3.1.2.1.2 Evaluation--OM-10, Paragraph 4.2.2.2, states: "Category A valves, which are containment isolation valves, shall be tested in accordance with Federal Regulation

10 CFR 50, Appendix J. Containment isolation valves which also provide a RCS pressure isolation function shall additionally be tested in accordance with Paragraph 4.2.2.3." The NRC approved the use of OM-10 for CIVs with exceptions that require analysis of leakage rates and corrective actions in accordance with the requirements of Paragraphs 4.2.2.3(e) and (f) (see 57 FR 34666, August 6, 1992).

The OM Code is intended to verify the operational readiness of individual components. Failure of a valve to meet an acceptance criteria indicates that the valve is degraded and may not be capable of performing its safety function. However, the Category A leakage limit assigned to individual CIVs is an artificially derived value because the only leakage sensitive limit for valves whose only Category A function is containment isolation is the $0.6L_a$ total leakage from containment limit. If a CIV exceeds its leakage rate limit, it indicates that the valve has not seated tightly and may be degraded. However, exceeding an individual CIV leakage rate limit does not indicate that the group of all CIVs cannot meet their leak tight safety function unless the $0.6L_a$ total leakage limit is exceeded. Applying the analysis of leakage rates and corrective action requirements of Paragraphs 4.2.2.3(e) and (f) in this situation may not be appropriate because the group of all CIVs can meet their leak tight safety function. Requiring the licensee to delay plant startup or to shutdown the plant to repair or replace a CIV that exceeds its individual limit would be a hardship and would not provide a compensating increase in the level of quality and safety as long as the overall leakage rate is less than $0.6L_a$.

If the leakage rate for a valve is significant for its size, beyond the leakage associated with seat damage or slight misalignment, it could indicate other significant valve degradation problems that could result in the valve failing to go to its safety position. In this case, continued plant operation prior to 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 overall leakage rate to approach the $0.6L_a$ limit. In cases where a valve's leakage rate is so high that its closure capability is questionable, it is not only a concern of exceeding the leak rate testing requirements of Paragraph 4.2.2, it is also a concern with not meeting the valve exercising requirements of OM-10, Paragraph 4.2.1 or 4.3.2.

The licensee did not provide details about the evaluation that would be performed to demonstrate that "even if a valve has exceeded its permissible leakage rate, the overall containment leakage rate will be maintained below $0.6L_a$ until the next Type C tests." To make this determination it may be necessary to ascertain the root cause of the increased leakage rate and establish the rate at which this degradation could progress. This evaluation is an important aspect of this request and should be performed in a manner that provides a high level of assurance that delaying the repair or replacement of individual valves with high leakage rates will not result in exceeding the $0.6L_a$ limit before the next leakage rate tests.

Based on the determination that requiring the licensee to delay plant startup or to shutdown the plant to repair or replace a CIV that exceeds its individual limit would be a hardship and would not provide a compensating increase in the level of quality and safety as long as the leakage rate does not indicate the probability of severe valve degradation and the overall leakage rate is less than $0.6L_a$, we recommend that the alternative be approved pursuant with 10CFR50.55a(a)(3)(ii) with the following provision. The licensee's evaluation should be documented and be performed in a manner that provides a high level of assurance that delaying the repair or replacement of valves with high leakage rates will not result in exceeding the $0.6L_a$ limit before the next leakage rate tests.

This alternative should not be used for valves that perform a limited leakage function in addition to or other than containment isolation (e.g., pressure isolation), because the basis for the leakage limits for these valves is different than the total containment leakage limit discussed above.

3.1.3 Isolation Valve Leakage Rate Corrective Actions

3.1.3.1 Relief Request. V-52 requests relief from the leak rate test corrective action requirements of OM-10, Paragraph 4.2.2.3(f), for the refueling water storage tank (RWST) isolation valves listed below. The licensee proposes to allow an evaluation of leakage rates that are above the allowable leakage limits for individual valves as long as the overall allowable leakage rate to the RWST remains below the overall limit for the RWST. If the evaluation indicates that the overall leakage rate is below the RWST limit, the licensee proposes that the valve(s) with the high leakage rate need not be repaired or replaced.

Unit 1 Valves	Unit 2 Valves
1-CH-LCV-1115B	2-CH-LCV-2115B
1-CH-LCV-1115D	2-CH-LCV-2115D
1-SI-25	2-SI-25
1-SI-MOV-1885A	2-SI-MOV-2885A
1-SI-MOV-1885B	2-SI-MOV-2885B
1-SI-MOV-1885C	2-SI-MOV-2885C
1-SI-MOV-1885D	2-SI-MOV-2885D

3.1.3.1.1 Licensee's Basis For Requesting Relief--The following text is quoted from relief request V-52 in the licensee's submittal for Surry Power Station, Units 1 and 2, dated April 26, 1994:

> Valves 1-CH-LCV-1115B (2-CH-LCV-2115B) and D, and 1(2)-SI-25 are in the supply lines to the charging pumps from the RWST. Valves 1-SI-MOV-1885A, B, C, and D (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 wate 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.

Alternate Testing: In addition to repair or replacement as corrective actions, an evaluation can be performed which demonstrates that even if a valve has exceeded its permissible leakage rate, the overall leakage rate to the RWST will be maintained below the overall allowable RWST leakage rate. No repair or replacement is necessary if the evaluation is performed.

3.1.3.1.2 Evaluation--OM-10, Paragraph 4.2.2.3, states: "Category A valves, which perform a function other than containment isolation, shall be seat leakage tested to verify their leak tight integrity." The OM Code is intended to verify the operational readiness of individual components. Failure of a valve to meet an acceptance criteria indicates that the valve is degraded and may not be capable of performing its safety function. However, the leakage rate limits assigned to individual RWST isolation valves are artificially derived values because the only leakage sensitive limit for these valves is the overall leakage limit to the RWST. If one of these valves exceeds its leakage rate limit, it indicates that the valve has not seated tightly and may be degraded. However, exceeding an individual leakage rate limit does not indicate that the group of all RWST isolation valves cannot meet their leak tight safety function unless the leakage limit to the RWST is exceeded. Applying the analysis of leakage rates and corrective action requirements of Paragraphs 4.2.2.3(e) and (f) in this situation may not be appropriate because the group of valves can meet their leak tight safety function. Requiring the licensee to delay plant startup or to shutdown the plant to repair or replace one of these valves that exceeds its individual limit would be a hardship and would not provide a compensating increase in the level of quality and safety as long as the overall leakage rate is less than the specified limit to the RWST.

If the leakage rate for a valve is significant for its size, beyond the leakage associated with seat damage or slight misalignment, it could indicate other significant valve degradation problems that could result in the valve failing to go to its safety position. In this case, continued plant operation prior to 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 overall leakage rate to approach the overall limit. In cases where a valve's leakage rate is so high that its closure capability is questionable, it is not only a concern of exceeding the leak rate testing requirements of Paragraph 4.2.2, it is also a concern with not meeting the valve exercising requirements of OM-10, Paragraph 4.2.1 or 4.3.2.

The licensee did not provide details about the evaluation that would be performed 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." To make this determination it may be necessary to ascertain the root cause of the increased leakage rate and establish the rate at which this degradation could progress. This evaluation is an important aspect of this request and should be performed in a manner that provides a high level of assurance that delaying the repair or replacement of individual valves with high leakage rates will not result in exceeding the overall limit before the next leakage rate tests.

Based on the determination that requiring the licensee to delay plant startup or to shutdown the plant to repair or replace a RWST isolation valve that exceeds its individual limit would be a hardship and would not provide a compensating increase in the level of quality and safety as long as the leakage rate does not indicate the probability of severe valve degradation and the overall leakage rate is less than limit, we recommend that the alternative be approved pursuant with 10CFR50.55a(a)(3)(ii) with the following provision. The licensee's evaluation should be documented and be performed in a manner that provides a high level of assurance that delaying the repair or replacement of valves with high leakage rates will not result in exceeding the overall limit before the next leakage rate tests.

This alternative 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.

3.2 Safety Injection System

3.2.1 Category C Valves

3.2.1.1 Relief Request. V-26 requests relief from the test frequency requirements of OM-10, Paragraph 4.3.2.2, for the accumulator discharge check valves, 1(2)-SI-107, -109, -128, -130, -145, and -147. The licensee proposes to verify a full-stroke exercise of these valves using nonintrusive techniques on a sampling basis during refueling outages. All of these valves will be tested with flow each refueling outage and one valve from the group of 1(2)-SI-107, -109, -128, and -145 and one valve from the group of 1(2)-SI-130 and -147 will be verified open with nonintrusive methods during each outage on a rotating basis.

3.2.1.1.1 Licensee's Basis For Requesting Relief--The following text is quoted from relief request V-26 in Revision 0 of the Surry Power Station, Units 1 and 2, third interval IST program submitted by letter dated October 19, 1993:

> Non-intrusive techniques are used to verify obturator movement for the SI accumulator discharge check valves. These techniques provide a "positive means" for verifying obturator movement, however, due to the burden of applying these techniques in the field, a sampling program will be used as described below.
>
> Alternate Testing: During the first refueling outage where non-intrusive techniques are used, all valves in the group will be tested to verify that the techniques verify valve obturator movement. During subsequent refueling outages, flow testing will be performed on all valves in the group, but the non-intrusive techniques need be applied only to one valve in each group, on a rotating basis, unless indications of problems are identified. In this case, all valves in the group will be subjected to the non-intrusive techniques. The test frequency is in accordance with GL 89-04, Position 2. Valves 1(2)-SI-130 and -147 are in one group and valves 1(2)-SI-107, -109, -128 and -145 are in the other group. Because 1(2)-SI-130 and -147 are downstream from where RHR connects to the SI line, they experience different service conditions than the other valves. The justification for testing these valves during reactor refuelings was moved to Reactor Refueling Justification RRV-3

3.2.1.1.2 Evaluation--The Code requires check valves to be exercised to the position(s) required to fulfill their safety function(s). To verify the disk position of check valves that do not have external disk position indication, the Code allows the use of indirect evidence (such as changes in system pressure, flow, temperature, or level) or other positive means. Nonintrusive techniques can be used as "other positive means" to verify the full-stroke of check valves, although in most cases the flow rate must be sufficient to stroke the valves to their backstops. The licensee proposes to use nonintrusive techniques to verify the capability of the subject valves to open. They propose to perform the nonintrusive testing on a sampling basis during refueling outages. During the first refueling outage that this test method is employed, all valves will be tested using nonintrusive methods. During subsequent refueling outages, all valves will be exercised at the partial flow rate used during the initial testing and one valve from each group will be verified open using nonintrusives.

Nonintrusive techniques have been shown to be effective in verifying a full-stroke exercise of check valves by industry group testing programs and by on-site 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 on-site testing. If performed in accordance with quality assurance program requirements, these techniques are considered "other positive means" in accordance with OM-10, Paragraph 4.3.2.4(a), and relief is not required for their use except as would be necessary for the testing frequency.

These valves are the accumulator discharge and combined header check valves. The only flow path through these valves is into the RCS. It is impractical to exercise these valves open during power operations because neither the accumulators nor the RHR pumps are capable of overcoming normal operating RCS pressure Valves 1(2)-SI-130 and -147 are part-stroke exercised by RHR flow during cold shutdowns since they are in the RHR flow paths to the RCS cold legs. However, it is impractical to exercise the remaining valves because the accumulator discharge isolation valves are closed during shutdown and required to remain closed to prevent accumulator discharge which could lead to a low-temperature overpressurization of the RCS. Therefore, it is impractical to verify a full-stroke exercise of these valves with flow quarterly during power operations or during cold shutdowns. Even during refueling outages, a full differential pressure accumulator discharge could damage reactor core components. Therefore, the only practical nonintrusive method of full-stroke exercising these valves is to pass a partial flow through them and verify a full-stroke using nonintrusive diagnostics. Because of the difficulty and time required to set up the test equipment, performing nonintrusive testing of each of these valves every refueling outage would be burdensome to the licensee, therefore, performing this testing on a sampling basis should provide a reasonable assurance of valve operational readiness.

By performing nonintrusive testing initially on all valves in the group, the licensee demonstrates that the partial flow fully opens all of the valves and that the nonintrusive method is capable of verifying a full-stroke. By repeating the flow test for all valves each refueling outage under the same conditions, the licensee passes the same flow rate through the valves that has been shown to full-stroke them when they are in good condition. The nonintrusive verification of one of the group valves, verifies that the sampled valve is capable of a full-stroke, which provides assurance that it is not significantly degraded. Since the sampled valve is representative of all group valves, this testing provides assurance of the operational readiness of all group valves. If the licensee finds a problem with the sampled valve, the remaining group valves would be checked with the nonintrusive technique during that outage. When the system has not been modified and the flow and pressure conditions are repeated, no phenomena should invalidate the testing as verified initially that would not be indicated by a problem in one of the group valves. If the licensee modifies the system or performs the testing with different test conditions, the initial verifications should be repeated.

The following guidelines should be observed when using nonintrusive testing techniques in a sampling plan during refueling outages:

a. Part-stroke exercise the valves quarterly or during cold shutdowns if practical.
b. The valves in the group should meet the grouping criteria of GL 89-04, Position 2.
c. The test pressures and flow conditions should cause the valves to fully stroke.
d. During the initial test, verify a full-stroke of all group valves using nonintrusives.
e. During subsequent tests, exercise each valve with flow at the prescribed test conditions.
f. At each test, perform nonintrusive verification on one group valve on a rotating schedule.
g. If problems are found with the sampled valve, test the other group valves using nonintrusive techniques during the same outage.

The licensee's proposed alternate testing appears to comply with most of the above conditions, however, it is unclear from the submittal if all of these conditions are met. The licensee should verify that the testing of the subject valves complies with all of these guidelines. The proposed grouping in this request does not appear to comply with the GL 89-04 requirement that group valves have the same service conditions. Valve 1(2)-SI-109 is the second check valve (closer to the RCS) in the injection line from the accumulator to the RCS while the other three group valves are the first check valves (closer to the accumulators). Valve 1(2)-SI-109 is normally subjected to RCS pressure, water chemistry, and possibly elevated temperatures while the other group valves do not normally experience these conditions. These and other possible differences may affect the corrosion, erosion, wear, etc. for this valve such that it is not representative of the other valves in the proposed group.

Based on the impracticality and burden of meeting the Code requirements for the subject valves and considering that the proposed testing should provide a reasonable assurance of valve operation readiness if all of the guidelines identified above for this test method are satisfactorily met, we recommend that relief be granted from the Code requirements pursuant with 10CFR50.55a(f)(6)(i) with the following provision. To use this method, all of the guidelines listed in this evaluation should be satisfied.

3.2.1.2 Relief Request. V-27 requests relief from the exercising method requirements of OM-10, Paragraphs 4.3.2.2, for the safety injection to RCS hot legs check valves, 1(2)-SI-88, -91, -94, -238, -239, and -240. The licensee proposes to exercise these valves closed as pairs instead of individually at the frequency described in TS Table 4.1-2A. If a pair fails the test, both valves will be subject to inspection, repair, or replacement.

3.2.1.2.1 Licensee's Basis For Requesting Relief--The following text is quoted from relief request V-27 in Revision 0 of the Surry Power Station, Units 1 and 2, third interval IST program submitted by letter dated October 19, 1993:

> Individual valve closure cannot be verified for valves 1(2)-SI-88, -91, -94, -238, -239 and -240. There are no drains between the valve pairs 1(2)-SI-88 and 1(2)-SI-238, 1(2)-SI-91 and 1(2)-SI-239, and 1(2)-SI-94 and 1(2)-SI-240.
>
> Alternate Testing: A leakage test will be performed on each of the three pairs of valves and the leakage of each pair will be compared to a limit. If the leakage limit is exceeded, both valves in the pair will be subject to inspection, repair or replacement. Note that there is no specified permissible accident leakage limit for these valves. Therefore, these valves are Category C.

3.2.1.2.2 Evaluation--The Code requires a full-stroke exercise of safety-related check valves quarterly, if practical, and provides a hierarchy for part and full-stroke exercising quarterly, at cold shutdowns, or during refueling outages if quarterly full-stroke exercising is impractical. The licensee proposes to exercise these valves closed as pairs instead of individually at the frequency described in TS Table 4.1-2A. If a pair fails the test, both valves will be subject to inspection, repair, or replacement.

Valves 1(2)-SI-88, 91, 94, 238, 239, and 240 are in the safety injection lines to the RCS hot legs with two valves in series in each line (e.g., 1-SI-88 and -238). These valves are ASME Code Class 1 and form the boundary with the connected ASME Code Class 2 piping. The systems that are connected to these injection headers are the chemical and volume control and low head safety injection systems. Portions of these systems are low pressure (i.e., the relief valves on the low head safety injection headers are set to open at 220 psig). The subject valves are not identified as PIVs in the plant TS or in the licensee's response to Generic Letter 87-06, dated June 12, 1987. The Generic Letter 87-06 response identifies motor operated valves (MOVs) 1-SI-MOV-1869A, -1869B, -1890A, and -1890B as PIVs in the hot leg injection headers. These MOVs also perform a CIV function and their leak tight closure capability is periodically verified by an Appendix J, Type C, leak rate test every refueling outage. These MOVs provide one barrier between the RCS and portions of the interconnected low pressure systems. The licensee's response to Generic Letter 87-06 does not identify a second barrier in the hot leg injection headers.

The only feasible conventional method for verifying these valves in the closed position is leak rate testing. However, there are no test connections installed in the system to enable individual leak rate testing of these valves, therefore, it is impractical to individually leak test these valves. To permit individual leak testing it would be necessary to install test connections. The major system modifications to install test connections to allow individual leak testing would be burdensome to the licensee. Even if test connections were installed, it would be impractical to test these valves quarterly since the valves are located inside the subatmospheric containment and are inaccessible during reactor operation. Further, leak rate testing during each cold shutdown would require a significant amount of time for test equipment setup, test performance, and test equipment removal and could result in a delay in the return to power. This would be burdensome for the licensee due to the possibility that it could delay startup from cold shutdown.

In cases where there is no practical means to individually verify the closure capability of two check valves in a series arrangement, the staff has frequently granted relief to test the series pair as a unit. To obtain this relief, the licensee should meet the following conditions:

a. A safety analysis review is performed to determine the function of the subject valves
b. Only one of the valves is necessary to perform the safety function
c. Neither valve performs a function that requires leakage to be limited to a specific amount
d. Both valves are included in the IST program
e. Both valves are subject to equivalent quality assurance criteria
f. The pair is verified closed at the Code frequency (in accordance with OM-10 para. 4.3.2)
g. The acceptance criteria is appropriate for the safety function performed
h. If the criteria is exceeded, both valves are declared inoperable until they are repaired or replaced.

The licensee's proposed alternate testing appears to comply with several of the above conditions, however, it is unclear from the submittal if all of these conditions have been met. The licensee should document their review of the plant safety analysis and the determination that only one of the two valves is credited in the safety analysis (that is, one valve could be removed without creating an unreviewed safety question or creating a conflict with regulatory or license requirements). The basis for the test acceptance criteria should also be documented. This documentation should be maintained on site for inspection by the staff.

This test method should not be used when the safety analysis requires closure of a specific valve because testing a series valve pair as a unit cannot provide assurance that a specific valve in the pair is capable of performing a closed safety function. In addition, this method should not permit extension of a Code Class Boundary or taking credit for a non-safety grade component to perform a safety-related function. If the licensee's review determines that both series valves are specifically required by the plant safety analysis assumptions, the licensee should establish a positive means to verify the capability of each of the pair of valves to function. It may be feasible to verify the closure of these valves using a nonintrusive technique. Disassembly and inspection of each valve may also be used as an alternative to closure testing. However, neither nonintrusive examination or disassembly and inspection may be used as an alternative to verifying the leak tight integrity of a check valve.

Testing check valves closed as a pair demonstrates that at least one of the two valves closes. The remaining valve could be failed and this would not be apparent from the testing. Both series valves would have to fail to close in order for the pair to fail to block reverse flow. Therefore, when the pair fails the closure test, both valves should be declared inoperable and be repaired or replaced as appropriate. The proposed corrective action does not mention declaring the valves inoperable and it appears to offer inspection as an alternative to repair or replacement. Because both valves would have to have failed in order for the pair to fail the test, anything short of repair or replacement of both valves is unacceptable.

Based on the impracticality and burden of meeting the Code requirements for the subject valves and considering the acceptability of testing these valves as pairs if all of the conditions identified above for this test method are satisfactorily met, we recommend that relief be granted from the Code requirements pursuant with 10CFR50.55a(f)(6)(i) with the following provisions. To use this method, all of the conditions listed in this evaluation should be satisfied. The required documentation should be prepared and be available for inspection and should include information on the safety analysis, quality assurance requirements, the acceptance criteria, and the corrective actions.

3.3 Feedwater System

3.3.1 Category C Valves

3.3.1.1 Relief Request. V-41 requests relief from the test frequency requirements of OM-10, Paragraph 4.3.2.4(c), for the auxiliary feedwater (AFW) pump recirculation line and pump oil cooler check valves, 1(2)-FW-144, -148, -159, -163, -174, and -178. The licensee proposes to disassemble and inspect these valves on a sampling basis at a refueling outage interval, but not necessarily during the refueling outage.

3.3.1.1.1 Licensee's Basis For Requesting Relief--The following text is quoted from relief request V-41 in Revision 0 of the Surry Power Station, Units 1 and 2, third interval IST program submitted by letter dated October 19, 1993:

> These check valves cannot be partial or full flow tested because instrumentation is not installed to measure flow or differential pressure. There is no other indirect means to verify full flow for these valves with the current configuration. These check valves can be disassembled while the plant is operating. To allow for flexibility in planning for refueling outages and still meet the intent of OM Part 10, the valves will be disassembled on a reactor refueling frequency but not necessarily during refueling outages.
>
> Alternate Testing: Valves 1(2)-FW-144, 159, and 174 will be grouped together; valves 1-FW-148, 163, and 178 will be grouped together and one valve from each group will be disassembled and inspected on a reactor refueling frequency. A different valve from each group will be disassembled for each inspection. If a valve fails its inspection, the remaining valves in the group will be disassembled and inspected.

3.3.1.1.2 Evaluation--The Code requires a full-stroke exercise of safety-related check valves quarterly, if practical, and provides a hierarchy for part and full-stroke exercising quarterly, at cold shutdowns, or during refueling outages if quarterly full-stroke exercising is impractical. The licensee proposes to disassemble and inspect the subject valves on a sampling basis each refueling interval (one valve from each group will be disassembled every refueling interval, possibly during power operations).

Valves 1(2)-FW-144, -159, and -174 are the AFW pump minimum recirculation line check valves and 1(2)-FW-148, -163, and -178 are the AFW pump oil cooler check valves. These simple check valves do not have position indication, therefore, the only practicable conventional method of verifying a full-stroke exercise open is by verifying maximum accident condition flow through them. It is impractical to verify maximum accident flow through these valves because the instrumentation necessary to make this verification is not installed in the recirculation and oil cooler lines. Verifying a full-stroke exercise of these valves with flow could only be accomplished if flow rate instrumentation were installed. These modifications would be burdensome for the licensee. Since it is impractical to verify design accident flow through these valves using conventional methods, the licensee's proposal to disassemble and inspect them may be the only practical method to periodically verify their full-stroke capability. The proposed method is permitted by OM-10, Paragraph 4.3.2.4(c), however, the proposed test frequency and plant mode are not in accordance with OM-10.

OM-10, Paragraph 4.3.2.4(c), permits the use of check valve disassembly every refueling outage as an alternative to exercising. GL 89-04, Position 2, allows the use of a sampling program for identical valves in similar applications. Therefore, relief is granted by GL 89-04 to use sample disassembly and inspection of check valves during refueling outages in lieu of full-stroke exercising with flow when exercising with flow is impractical. However, the relief granted by GL 89-04 is contingent upon the disassembly and inspection being performed in accordance with the provisions of the generic letter.

In the past several years there has been substantial development and refinement of alternate techniques for testing check valves. Therefore, some test method may be feasible to verify the full-stroke open capability of these valves in lieu of disassembly and inspection. The licensee should consider methods such as using nonintrusive techniques (e.g., acoustics, ultrasonics, magnetics, radiography, or thermography) to verify a full-stroke of these valves. This testing may only be practical at refueling outages. The licensee should perform their investigation and if a test method is found to be practicable, the IST requirements for these valves should be satisfied by testing instead of disassembly and inspection.

The response to Question 14 in the Minutes of the Public Meetings on Generic Letter 89-04, indicates that in order to alter the disassembly and inspection schedule of GL 89-04, "...the licensee should justify and document the proposed change. The justification should address the effect of the proposed disassembly/inspection schedule on the sampling program." The licensee's request seeks the option of performing the disassembly and inspection of the subject valves during power operations as opposed to during refueling outages. The following issues affect this proposed schedule for disassembly and inspection of these valves:

- The acceptability of the refueling interval frequency
- Entering a TS Limiting Conditions for Operation (LCO) action statement to perform preventative maintenance (PM)
- Appropriate corrective actions if sample disassembly is done during power operations

GL 89-04, Position 2, indicates that for sample disassembly and inspection "A different valve of each group is required to be disassembled, inspected, and manually full-stroke exercised at each successive refueling outage...." The reasons that the generic letter specifies that disassembly be performed during refueling outages are "...due to the scope of this testing, the personnel hazards involved and system operating restrictions...." In many cases where disassembly and inspection is used in lieu of testing, there are reasons that the disassembly must be performed during an extended outage (e.g., the RCS must be depressurized, the reactor vessel must be drained to the mid-loop level, or the disassembly requires an entire safety system be removed from service). However, where valves can be safely and practically disassembled and inspected during power operation, doing so each refueling outage interval, but not necessarily during the outage, should not affect the ability of this method to assess valve condition. Therefore, performing a sample disassembly and inspection of these valves once each refueling cycle during power operations should provide adequate information to determine valve operational readiness.

Disassembly of one of these valves may render the associated safety system train inoperable, which could result in entry into a TS LCO action statement. NRC Inspection Manual, Part 9900: Technical Guidance, titled "Maintenance - Voluntary Entry into Limiting Conditions for Operation Action Statements to Perform Preventative Maintenance" provides guidance on performing PM when the maintenance requires rendering the affected system or equipment inoperable. The NRC considers check valve disassembly and inspection to be an intrusive maintenance procedure and not a test. Even though an LCO action statement can be entered to perform surveillance testing, an action statement should not be entered routinely to perform PM activities unless it is justified in accordance with the NRC Inspection Manual, Part 9900. Therefore, if the proposed disassembly and inspection is to be performed during power operation and requires entry into an LCO action statement, the licensee should consider the following guidelines paraphrased from Part 9900:

a. There is a reasonable expectation that the on-line disassembly and inspection would improve safety by ensuring the operational readiness of the valves. The increase in reliability should exceed the effect of the increase in system unavailability.
b. The disassembly and inspection activity should be carefully planned to prevent repeatedly entering and exiting LCO action statements.
c. Other related equipment should not be removed from service during the performance of the on-line maintenance activity.
d. Maintenance should not be performed on-line unless confidence in the operability of the redundant subsystem is high. If equipment is degraded or trending towards a degraded condition in one train of a safety system, the redundant train should not be removed from service to perform on-line disassembly and inspections.
e. While performing an on-line maintenance activity, avoid performing other testing or maintenance that would increase the likelihood of a transient. There should be a reasonable expectation that the facility will continue to operate in a stable manner.

The corrective action requirements for a degraded valve present an additional complication when performing sample disassembly and inspection during power operations. GL 89-04, Position 2, states "If the disassembled valve is not capable of being full-stroke exercised or there is binding or failure of valve internals, the remaining valves in that group must also be disassembled, inspected, and manually full-stroke exercised during the same outage." Since the GL 89-04 grouping criteria requires "each valve in the group be the same design (manufacturer, size, model number, and materials of construction) and have the same service conditions including valve orientation," the valves in a sample group should be subject to the same degradation mechanisms and rates, otherwise the valve grouping is inappropriate and the valves should be placed in smaller groups. Therefore, failure of the disassembled valve in a sample group places in question the operational readiness of the remaining group valves. Until the operational readiness of these valves is verified by disassembly and inspection or by testing, their continued capability to perform their function should not be assumed.

If a valve disassembled during power operation is found to be failed or excessively degraded, the licensee should immediately (before the end of the shift during which the failure is discovered) analyze the valve failure to determine the degradation mechanism and the likelihood that the other group valves are affected significantly by this mechanism. If the licensee's evaluation indicates that continued dependance on the operational readiness of these valves is not warranted, all group valves should be immediately declared inoperable and the appropriate TS required actions be followed. If the licensee determines that continued dependance on the operational readiness of these valves is warranted (based on past examinations, measurements, etc.), the valves need not be immediately declared inoperable. However, all group valves should be disassembled and inspected or have their operational readiness verified by testing within the TS action statement time specified for one train of the safety system being inoperable (72 hours for an AFW train).

Based on the determination that compliance with the exercising requirements of the Code is impractical and burdensome and considering that sample disassembly and inspection performed in accordance with GL 89-04 each refueling interval should provide reasonable assurance of valve operational readiness, we recommend that relief be granted pursuant with 10CFR50.55a(f)(6)(i) with the following provisions. If the proposed disassembly and inspection requires entry into an LCO action statement, the licensee should justify the alternate schedule as indicated in the response to Question 14 of the Minutes of the Public Meetings on Generic Letter 89-04, and should consider the guidelines listed above that are based on the NRC Inspection Manual, Part 9900. In addition, if a valve disassembled during power operations fails or is found to be excessively degraded, the licensee should comply with the alternate corrective actions described above.

3.4 Main Steam System

3.4.1 Category C Valves

3.4.1.1 Relief Request. V-42 requests relief from the test frequency requirements of OM-10, Paragraph 4.3.2.4(c), for the main steam header supply check valves to the turbine driven AFW pump, 1(2)-MS-176, -178, and -182. The licensee proposes to disassemble and inspect these valves on a refueling outage interval, but not necessarily during the refueling outage.

3.4.1.1.1 Licensee's Basis For Requesting Relief--The following text is quoted from relief request V-42 in Revision 0 of the Surry Power Station, Units 1 and 2, third interval IST program submitted by letter dated October 19, 1993:

> These check valves cannot be back seat tested with flow during normal operation because this test would require the venting of process steam while verifying the closed position. Venting of process steam would endanger the test personnel. However, these check valves can be isolated and disassembled while the plant is operating. To allow for flexibility in planning for refueling outages and still meet the intent of OM Part 10, the valves will be disassembled on a reactor refueling frequency but not necessarily during refueling outages.
>
> Alternate Testing: These valves will be grouped together and one valve from this group will be disassembled and inspected on a reactor refueling frequency. A different valve will be disassembled for each inspection. If a valve fails its inspection, the remaining valves in the group will be disassembled and inspected. This test frequency is in accordance with Generic Letter 89-04, Position 2. The valves will be full flow tested every three months.

3.4.1.1.2 Evaluation--The Code requires a full-stroke exercise of safety-related check valves quarterly, if practical, and provides a hierarchy for part and full-stroke exercising quarterly, at cold shutdowns, or during refueling outages if quarterly full-stroke exercising is impractical. The licensee proposes to disassemble and inspect the subject valves on a sampling basis each refueling interval (one valve from the group will be disassembled every refueling interval, possibly during power operations).

Valves 1(2)-MS-176, -178, and -182 are check valves in the steam supply lines to the turbine driven AFW pump turbine. These simple check valves do not have position indication, therefore, the only practicable conventional method of verifying their closure is by leak testing or establishing a reversed flow differential pressure across them. Verifying the closure capability of these valves by leak rate testing requires the pressurization of the downstream piping and venting of the upstream piping. Since the upstream piping is pressurized with high pressure steam during normal operation, this testing could not be done quarterly. Due to the system design, a leak test to verify valve closure cannot be done since test lines are not installed to facilitate this testing. Since it is impractical to verify closure of these valves by conventional methods, the licensee's proposal to disassemble and inspect them may be the only practicable method to periodically verify their full-stroke capability. The proposed method is permitted by OM-10, Paragraph 4.3.2.4(c), however, the proposed test frequency is not in accordance with OM-10.

OM-10, Paragraph 4.3.2.4(c), permits the use of check valve disassembly every refueling outage as an alternative to exercising. GL 89-04, Position 2, allows the use of a sampling program for identical valves in similar applications. Therefore, relief is granted by GL 89-04 to use sample disassembly and inspection of check valves during refueling outages in lieu of full-stroke exercising with flow when exercising with flow is impractical. However, the relief granted by GL 89-04 is contingent upon the disassembly and inspection being performed in accordance with the provisions of the generic letter.

In the past several years there has been substantial development and refinement of alternate techniques for testing check valves. Therefore, some test method may be feasible to verify the closure capability of these valves in lieu of disassembly and inspection. The licensee should consider methods such as using nonintrusive techniques (e.g., acoustics, ultrasonics, magnetics, radiography, or thermography) to verify closure of these valves. This testing may only be practical at refueling outages. The licensee should perform their investigation and if a test method is found to be practicable, the IST requirements for these valves should be satisfied by testing instead of disassembly and inspection.

The response to Question 14 in the Minutes of the Public Meetings on Generic Letter 89-04, indicates that in order to alter the disassembly and inspection schedule of GL 89-04, "...the licensee should justify and document the proposed change. The justification should address the effect of the proposed disassembly/inspection schedule on the sampling program." The licensee's request seeks the option of performing the disassembly and inspection of the subject valves during power operations as opposed to during refueling outages. The following issues affect this proposed schedule for disassembly and inspection of these valves:

- The acceptability of the refueling interval frequency
- Entering a TS Limiting Conditions for Operation (LCO) action statement to perform preventative maintenance (PM)
- Appropriate corrective actions if sample disassembly is done during power operations

GL 89-04, Position 2, indicates that for sample disassembly and inspection "A different valve of each group is required to be disassembled, inspected, and manually full-stroke exercised at each successive refueling outage...." The reasons that the generic letter specifies that disassembly be performed during refueling outages are "...due to the scope of this testing, the personnel hazards involved and system operating restrictions...." In many cases where disassembly and inspection is used in lieu of testing, there are reasons that the disassembly must be performed during an extended outage (e.g., the RCS must be depressurized, the reactor vessel must be drained to the mid-loop level, or the disassembly requires an entire safety system be removed from service). However, where valves can be safely and practically disassembled and inspected during power operation, doing so each refueling outage interval, but not necessarily during the outage, should not affect the ability of this method to assess valve condition. Therefore, performing a sample disassembly and inspection of these valves once each refueling cycle during power operations should provide adequate information to determine valve operational readiness.

Disassembly of one of these valves may render the associated safety system train inoperable, which could result in entry into a TS LCO action statement. NRC Inspection Manual, Part 9900: Technical Guidance, titled "Maintenance - Voluntary Entry into Limiting Conditions for Operation Action Statements to Perform Preventative Maintenance" provides guidance on performing PM when the maintenance requires rendering the affected system or equipment inoperable. The NRC considers check valve disassembly and inspection to be an intrusive maintenance procedure and not a test. Even though an LCO action statement can be entered to perform surveillance testing, an action statement should not be entered routinely to perform PM activities unless it is justified in accordance with the NRC Inspection Manual, Part 9900. Therefore, if the proposed disassembly and inspection is to be performed during power operation and requires entry into an LCO action statement, the licensee should consider the following guidelines paraphrased from Part 9900:

a. There is a reasonable expectation that the on-line disassembly and inspection would improve safety by ensuring the operational readiness of the valves. The increase in reliability should exceed the effect of the increase in system unavailability.
b. The disassembly and inspection activity should be carefully planned to prevent repeatedly entering and exiting LCO action statements.
c. Other related equipment should not be removed from service during the performance of the on-line maintenance activity.
d. Maintenance should not be performed on-line unless confidence in the operability of the redundant subsystem is high. If equipment is degraded or trending towards a degraded condition in one train of a safety system, the redundant train should not be removed from service to perform on-line disassembly and inspections.
e. While performing an on-line maintenance activity, avoid performing other testing or maintenance that would increase the likelihood of a transient. There should be a reasonable expectation that the facility will continue to operate in a stable manner.

The corrective action requirements for a degraded valve present an additional complication when performing sample disassembly and inspection during power operations. GL 89-04, Position 2, states "If the disassembled valve is not capable of being full-stroke exercised or there is binding or failure of valve internals, the remaining valves in that group must also be disassembled, inspected, and manually full-stroke exercised during the same outage." Since the GL 89-04 grouping criteria requires "each valve in the group be the same design (manufacturer, size, model number, and materials of construction) and have the same service conditions including valve orientation," the valves in a sample group should be subject to the same degradation mechanisms and rates, otherwise the valve grouping is inappropriate and the valves should be placed in smaller groups. Therefore, failure of the disassembled valve in a sample group places in question the operational readiness of the remaining group valves. Until the operational readiness of these valves is verified by disassembly and inspection or by testing, their continued capability to perform their function should not be assumed.

If a valve disassembled during power operation is found to be failed or excessively degraded, the licensee should immediately (before the end of the shift during which the failure is discovered) analyze the valve failure to determine the degradation mechanism and the likelihood that the other group valves are affected significantly by this mechanism. If the licensee's evaluation indicates that continued dependance on the operational readiness of these valves is not warranted, all group valves should be immediately declared inoperable and the appropriate TS required actions be followed. If the licensee determines that continued dependance on the operational readiness of these valves is warranted (based on past examinations, measurements, etc.), the valves need not be immediately declared inoperable. However, all group valves should be disassembled and inspected or have their operational readiness verified by testing within the TS action statement time specified for one train of the safety system being inoperable (72 hours for an AFW train).

Based on the determination that compliance with the exercising requirements of the Code is impractical and burdensome and considering that sample disassembly and inspection performed in accordance with GL 89-04 each refueling interval should provide reasonable assurance of valve operational readiness, we recommend that relief be granted pursuant with 10CFR50.55a(f)(6)(i) with the following provisions. If the proposed disassembly and inspection requires entry into an LCO action statement, the licensee should justify the alternate schedule as indicated in the response to Question 14 of the Minutes of the Public Meetings on Generic Letter 89-04, and should consider the guidelines listed above that are based on the NRC Inspection Manual, Part 9900. In addition, if a valve disassembled during power operations fails or is found to be excessively degraded, the licensee should comply with the alternate corrective actions described above.

3.5 Service Water System

3.5.1 Category C Valves

3.5.1.1 Relief Request. V-46 (Unit 1) requests relief from the test frequency requirements of OM-10, Paragraph 4.3.2.4(c), for the check valves in the service water supply lines to the main control room air conditioning system chillers, 1-SW-313, -323, and 2-SW-333. The licensee proposes to disassemble and inspect these valves on a refueling outage interval, but not necessarily during the refueling outage, until a system modification is performed that will permit quarterly testing, after which the valves will be tested quarterly.

3.5.1.1.1 Licensee's Basis For Requesting Relief--The following text is quoted from relief request V-46 in Revision 0 of the Surry Power Station, Unit 1, third interval IST program submitted by letter dated October 19, 1993:

> These check valves cannot be full flow tested because instrumentation is not installed to directly measure flow or differential pressure across the valve. According to Technical specification Paragraph 3.23.C.1.b, "If one chiller becomes inoperable, return the inoperable chiller to operable status within seven (7) days or bring both units to Hot Shutdown within the next six (6) hours and be in Cold Shutdown within the following 30 hours." Because the main control and emergency switchgear room emergency ventilation system is common for both units, the above action statement applies whenever Unit 1 or Unit 2 is operating.
>
> Given the scope of the required instrumentation modifications and the existing system configuration, it is estimated that installation of the appropriate flow and pressure instrumentation cannot be completed within the Technical Specification 7 day action statement. Two additional Main Control Room and Emergency Switchgear Room Air Conditioning System chillers are scheduled for installation by the end of 1993. The additional chillers will eliminate the need for entry into the Technical Specification action statement to install the instrumentation. Also, the flow elements for the chiller

service water pumps cannot be installed at power. Therefore, installation of the additional instrumentation is scheduled to be completed by the end of the Unit 1 Cycle 12 refueling outage currently scheduled for second quarter of 1994. These check valves can be disassembled while the plant is operating. To allow for flexibility in planning for refueling outages and still meet the intent of OM Part 10, the valves will be disassembled on a reactor refueling frequency but not necessarily during refueling outages.

Alternate Testing: These valves will be grouped together and one valve from this group will be disassembled and inspected on a reactor refueling frequency. A different valve will be disassembled for each inspection. If a valve fails its inspection, the remaining valves in the group will be disassembled and inspected. They will be part-stroked open once every three months with flow. This test frequency is in accordance with Generic Letter 89-04, Position 2. When flow instrumentation is installed in the second quarter of 1994, flow will be measured directly and the valves will be full flow tested once every three months.

3.5.1.1.2 Evaluation--The Code requires a full-stroke exercise of safety-related check valves quarterly, if practical, and provides a hierarchy for part and full-stroke exercising quarterly, at cold shutdowns, or during refueling outages if quarterly full-stroke exercising is impractical. The licensee proposes to disassemble and inspect the subject valves on a sampling basis each refueling interval (one valve from the group will be disassembled every refueling interval, possibly during power operations), until a system modification is performed that will permit quarterly testing, after which the valves will be tested quarterly.

Valves 1-SW-313, -323, and 2-SW-333 are the check valves in the service water supply lines to the main control room air conditioning system chillers. These simple check valves do not have position indication, therefore, the only practicable conventional method of verifying a full-stroke exercise open is by verifying maximum accident condition flow through them. It is impractical to verify maximum accident flow through these valves at any frequency because the instrumentation necessary to make this verification is not currently installed in the service water lines. Verifying a full-stroke exercise of these check valves with flow could only be accomplished if flow rate instrumentation were installed in these lines. The licensee indicated that these modifications will be performed during the second quarter of 1994. Since it is currently impractical to verify design accident flow through these valves using conventional methods, the licensee's proposal to disassemble and inspect them may be the only practical method to verify their full-stroke capability during the period until the modifications are completed. The proposed method is permitted by OM-10, Paragraph 4.3.2.4(c), however, the proposed frequency is not in accordance with OM-10.

OM-10, Paragraph 4.3.2.4(c), permits the use of check valve disassembly every refueling outage as an alternative to exercising. GL 89-04, Position 2, allows the use of a sampling program for identical valves in similar applications. Therefore, relief is granted by GL 89-04 to use sample disassembly and inspection of check valves during refueling outages in lieu of full-stroke exercising with flow when exercising with flow is impractical. However, the relief granted by GL 89-04 is contingent upon the disassembly and inspection being performed in accordance with the provisions of the generic letter.

The response to Question 14 in the Minutes of the Public Meetings on Generic Letter 89-04, indicates that in order to alter the disassembly and inspection schedule of GL 89-04, "...the licensee should justify and document the proposed change. The justification should address the effect of the proposed disassembly/inspection schedule on the sampling program." The licensee's request seeks the option of performing the disassembly and inspection of the subject valves during power operations as opposed to during refueling outages. The following issues affect this proposed schedule for disassembly and inspection of these valves:

- The acceptability of the refueling interval frequency
- Entering a TS Limiting Conditions for Operation (LCO) action statement to perform preventative maintenance (PM)
- Appropriate corrective actions if sample disassembly is done during power operations

GL 89-04, Position 2, indicates that for sample disassembly and inspection "A different valve of each group is required to be disassembled, inspected, and manually full-stroke exercised at each successive refueling outage...." The reasons that the generic letter specifies that disassembly be performed during refueling outages are "...due to the scope of this testing, the personnel hazards involved and system operating restrictions...." In many cases where disassembly and inspection is used in lieu of testing, there are reasons that the disassembly must be performed during an extended outage (e.g., the RCS must be depressurized, the reactor vessel must be drained to the mid-loop level, or the disassembly requires an entire safety system be removed from service). However, where valves can be safely and practically disassembled and inspected during power operation, doing so each refueling outage interval, but not necessarily during the outage, should not affect the ability of this method to assess valve condition. Therefore, performing a sample disassembly and inspection of these valves once each refueling cycle during power operations should provide adequate information to determine valve operational readiness.

Disassembly of one of these valves may render the associated safety system train inoperable, which could result in entry into a TS LCO action statement. NRC Inspection Manual, Part 9900: Technical Guidance, titled "Maintenance - Voluntary Entry into Limiting Conditions for Operation Action Statements to Perform Preventative Maintenance" provides guidance on performing PM when the maintenance requires rendering the affected system or equipment inoperable. The NRC considers check valve disassembly and inspection to be an intrusive maintenance procedure and not a test. Even though an LCO action statement can be entered to perform surveillance testing, an action statement should not be entered routinely to perform PM activities unless it is justified in accordance with the NRC Inspection Manual, Part 9900. Therefore, if the proposed disassembly and inspection is to be performed during power operation and requires entry into an LCO action statement, the licensee should consider the following guidelines paraphrased from Part 9900:

a. There is a reasonable expectation that the on-line disassembly and inspection would improve safety by ensuring the operational readiness of the valves. The increase in reliability should exceed the effect of the increase in system unavailability.

b. The disassembly and inspection activity should be carefully planned to prevent repeatedly entering and exiting LCO action statements.
c. Other related equipment should not be removed from service during the performance of the on-line maintenance activity.
d. Maintenance should not be performed on-line unless confidence in the operability of the redundant subsystem is high. If equipment is degraded or trending towards a degraded condition in one train of a safety system, the redundant train should not be removed from service to perform on-line disassembly and inspections.
e. While performing an on-line maintenance activity, avoid performing other testing or maintenance that would increase the likelihood of a transient. There should be a reasonable expectation that the facility will continue to operate in a stable manner.

The corrective action requirements for a degraded valve present an additional complication when performing sample disassembly and inspection during power operations. GL 89-04, Position 2, states "If the disassembled valve is not capable of being full-stroke exercised or there is binding or failure of valve internals, the remaining valves in that group must also be disassembled, inspected, and manually full-stroke exercised during the same outage." Since the GL 89-04 grouping criteria requires "each valve in the group be the same design (manufacturer, size, model number, and materials of construction) and have the same service conditions including valve orientation," the valves in a sample group should be subject to the same degradation mechanisms and rates, otherwise the valve grouping is inappropriate and the valves should be placed in smaller groups. Therefore, failure of the disassembled valve in a sample group places in question the operational readiness of the remaining group valves. Until the operational readiness of these valves is verified by disassembly and inspection or by testing, their continued capability to perform their function should not be assumed.

If a valve disassembled during power operation is found to be failed or excessively degraded, the licensee should immediately (before the end of the shift during which the failure is discovered) analyze the valve failure to determine the degradation mechanism and the likelihood that the other group valves are affected significantly by this mechanism. If the licensee's evaluation indicates that continued dependance on the operational readiness of these valves is not warranted, all group valves should be immediately declared inoperable and the appropriate TS required actions be followed. If the licensee determines that continued dependance on the operational readiness of these valves is warranted (based on past examinations, measurements, etc.), the valves need not be immediately declared inoperable. However, all group valves should be disassembled and inspected or have their operational readiness verified by testing within the TS action statement time specified for one train of the safety system being inoperable.

Based on the determination that compliance with the exercising requirements of the Code is impractical and burdensome and considering that sample disassembly and inspection performed in accordance with GL 89-04 each refueling interval should provide reasonable assurance of valve operational readiness, we recommend that relief be granted pursuant with 10CFR50.55a(f)(6)(i) with the following provisions. If the proposed disassembly and inspection requires entry into an LCO action statement, the licensee should justify the alternate schedule as indicated in the response to Question 14 of the Minutes of the Public Meetings on Generic Letter 89-04, and should consider the guidelines listed above that are based on the NRC Inspection Manual, Part 9900. In addition, if a valve disassembled during power operations fails or is found to be excessively degraded, the licensee should comply with the alternate corrective actions described above.

3.5.1.2 Relief Request. V-46 (Unit 2) requests relief from the test frequency requirements of OM-10, Paragraph 4.3.2.4(c), for the service water supply vent valves to the recirculation spray heat exchangers, 2-SW-247, -249, -251, and -253. The licensee proposes to disassemble and inspect these valves on a refueling outage interval, but not necessarily during the refueling outage.

3.5.1.2.1 Licensee's Basis For Requesting Relief--The following text is quoted from relief request V-46 in Revision 0 of the Surry Power Station, Unit 2, third interval IST program submitted by letter dated October 19, 1993:

> These check valves must open to provide an effective vent path to ensure that the service water headers are filled and flow through the recirculation spray heat exchangers is quickly established.
>
> There is no instrumentation to measure flow or differential pressure across the valves. The valves are inaccessible and cannot be manually manipulated without disassembly. The valves can be part-stroked open only when service water is sent through the recirculation spray heat exchangers. The recirculation spray heat exchangers are maintained dry to avoid fouling. With the current piping configuration, there is no means to part-stroke test these valves without fouling the heat exchangers.
>
> These check valves can be disassembled while the plant is operating. To allow for flexibility in planning for refueling outages and still meet the intent of OM Part 10, the valves will be disassembled on a reactor refueling frequency but not necessarily during refueling outages.
>
> Alternate Testing Proposed: These valves will be grouped together and one valve from this group will be disassembled and inspected on a reactor refueling frequency. A different valve will be disassembled for each inspection. If a valve fails its inspection, the remaining valves in the group will be disassembled and inspected.

3.5.1.2.2 Evaluation--The Code requires a full-stroke exercise of safety-related check valves quarterly, if practical, and provides a hierarchy for part and full-stroke exercising quarterly, at cold shutdowns, or during refueling outages if quarterly full-stroke exercising is impractical. The licensee proposes to disassemble and inspect the subject valves on a sampling basis each refueling interval (one valve from the group will be disassembled every refueling interval, possibly during power operations).

Valves 2-SW-247, -249, -251, and -253 are the service water vent valves in the supply lines to the recirculation spray heat exchangers. These simple check valves do not have position indication, therefore, the only practicable conventional method of verifying a full-stroke exercise open is by verifying maximum accident condition flow through them. It is impractical to verify maximum accident flow through these valves at any frequency because the instrumentation necessary to make this verification is not currently installed in the service water lines. Verifying a full-stroke exercise of these check valves with flow could only be accomplished if flow rate instrumentation were installed in these lines. Since it is impractical to verify design accident flow through these valves using conventional methods, the licensee's proposal to disassemble and inspect them may be the only practical method to verify their full-stroke capability. The proposed method is permitted by OM-10, Paragraph 4.3.2.4(c), however, the proposed frequency is not in accordance with OM-10.

OM-10, Paragraph 4.3.2.4(c), permits the use of check valve disassembly every refueling outage as an alternative to exercising. GL 89-04, Position 2, allows the use of a sampling program for identical valves in similar applications. Therefore, relief is granted by GL 89-04 to use sample disassembly and inspection of check valves during refueling outages in lieu of full-stroke exercising with flow when exercising with flow is impractical. However, the relief granted by GL 89-04 is contingent upon the disassembly and inspection being performed in accordance with the provisions of the generic letter.

In the past several years there has been substantial development and refinement of alternate techniques for testing check valves. Therefore, some test method may be feasible to verify the full-stroke open capability of these valves in lieu of disassembly and inspection. The licensee should consider methods such as using nonintrusive techniques (e.g., acoustics, ultrasonics, magnetics, radiography, or thermography) to verify a full-stroke of these valves. This testing may only be practical at refueling outages. The licensee should perform their investigation and if a test method is found to be practicable, the IST requirements for these valves should be satisfied by testing instead of disassembly and inspection.

The response to Question 14 in the Minutes of the Public Meetings on Generic Letter 89-04, indicates that in order to alter the disassembly and inspection schedule of GL 89-04, "...the licensee should justify and document the proposed change. The justification should address the effect of the proposed disassembly/inspection schedule on the sampling program." The licensee's request seeks the option of performing the disassembly and inspection of the subject valves during power operations as opposed to during refueling outages. The following issues affect this proposed schedule for disassembly and inspection of these valves:

- The acceptability of the refueling interval frequency
- Entering a TS Limiting Conditions for Operation (LCO) action statement to perform preventative maintenance (PM)
- Appropriate corrective actions if sample disassembly is done during power operations

GL 89-04, Position 2, indicates that for sample disassembly and inspection "A different valve of each group is required to be disassembled, inspected, and manually full-stroke exercised at each successive refueling outage...." The reasons that the generic letter specifies that disassembly be performed during refueling outages are "...due to the scope of this testing, the personnel hazards involved and system operating restrictions...." In many cases where disassembly and inspection is used in lieu of testing, there are reasons that the disassembly must be performed during an extended outage (e.g., the RCS must be depressurized, the reactor vessel must be drained to the mid-loop level, or the disassembly requires an entire safety system be removed from service). However, where valves can be safely and practically disassembled and inspected during power operation, doing so each refueling outage interval, but not necessarily during the outage, should not affect the ability of this method to assess valve condition. Therefore, performing a sample disassembly and inspection of these valves once each refueling cycle during power operations should provide adequate information to determine valve operational readiness.

Disassembly of one of these valves may render the associated safety system train inoperable, which could result in entry into a TS LCO action statement. NRC Inspection Manual, Part 9900: Technical Guidance, titled "Maintenance - Voluntary Entry into Limiting Conditions for Operation Action Statements to Perform Preventative Maintenance" provides guidance on performing PM when the maintenance requires rendering the affected system or equipment inoperable. The NRC considers check valve disassembly and inspection to be an intrusive maintenance procedure and not a test. Even though an LCO action statement can be entered to perform surveillance testing, an action statement should not be entered routinely to perform PM activities unless it is justified in accordance with the NRC Inspection Manual, Part 9900. Therefore, if the proposed disassembly and inspection is to be performed during power operation and requires entry into an LCO action statement, the licensee should consider the following guidelines paraphrased from Part 9900:

a. There is a reasonable expectation that the on-line disassembly and inspection would improve safety by ensuring the operational readiness of the valves. The increase in reliability should exceed the effect of the increase in system unavailability.
b. The disassembly and inspection activity should be carefully planned to prevent repeatedly entering and exiting LCO action statements.
c. Other related equipment should not be removed from service during the performance of the on-line maintenance activity.
d. Maintenance should not be performed on-line unless confidence in the operability of the redundant subsystem is high. If equipment is degraded or trending towards a degraded condition in one train of a safety system, the redundant train should not be removed from service to perform on-line disassembly and inspections.
e. While performing an on-line maintenance activity, avoid performing other testing or maintenance that would increase the likelihood of a transient. There should be a reasonable expectation that the facility will continue to operate in a stable manner.

The corrective action requirements for a degraded valve present an additional complication when performing sample disassembly and inspection during power operations. GL 89-04, Position 2, states "If the disassembled valve is not capable of being full-stroke exercised or there is binding or failure of valve internals, the remaining valves in that group must also be disassembled, inspected, and manually full-stroke exercised during the same outage." Since the GL 89-04 grouping criteria requires "each valve in the group be the same design (manufacturer, size, model number, and materials of construction) and have the same service conditions including valve orientation," the valves in a sample group should be subject to the same degradation mechanisms and rates, otherwise the valve grouping is inappropriate and the valves should be placed in smaller groups. Therefore, failure of the disassembled valve in a sample group places in question the operational readiness of the remaining group valves. Until the operational readiness of these valves is verified by disassembly and inspection or by testing, their continued capability to perform their function should not be assumed.

If a valve disassembled during power operation is found to be failed or excessively degraded, the licensee should immediately (before the end of the shift during which the failure is discovered) analyze the valve failure to determine the degradation mechanism and the likelihood that the other group valves are affected significantly by this mechanism. If the licensee's evaluation indicates that continued dependance on the operational readiness of these valves is not warranted, all group valves should be immediately declared inoperable and the appropriate TS required actions be followed. If the licensee determines that continued dependance on the operational readiness of these valves is warranted (based on past examinations, measurements, etc.), the valves need not be immediately declared inoperable. However, all group valves should be disassembled and inspected or have their operational readiness verified by testing within the TS action statement time specified for one train of the safety system being inoperable.

Based on the determination that compliance with the exercising requirements of the Code is impractical and burdensome and considering that sample disassembly and inspection performed in accordance with GL 89-04 each refueling interval should provide reasonable assurance of valve operational readiness, we recommend that relief be granted pursuant with 10CFR50.55a(f)(6)(i) with the following provisions. If the proposed disassembly and inspection requires entry into an LCO action statement, the licensee should justify the alternate schedule as indicated in the response to Question 14 of the Minutes of the Public Meetings on Generic Letter 89-04, and should consider the guidelines listed above that are based on the NRC Inspection Manual, Part 9900. In addition, if a valve disassembled during power operations fails or is found to be excessively degraded, the licensee should comply with the alternate corrective actions described above.

4. DEFERRED TEST EVALUATIONS

The following Cold Shutdown Justifications and Reactor Refueling Justifications involve the frequency of testing safety-related valves. These justifications are listed in Table 4.1 and are evaluated in accordance with the exercising frequency requirements of OM-10, Paragraph 4.2.1.1 or 4.3.2.1 as discussed below.

4.1 Bases for Deferring Valve Exercising

OM-10, Paragraphs 4.2.1.2 and 4.3.2.2, permit deferral of full-stroke exercising until cold shutdowns or refueling outages when this exercising is not practicable during plant operation. The justification for deferral of stroke testing should be documented in the Test Plan in accordance with OM-10, Paragraph 6.2(d).

4.2 Conclusion

For all of these relief requests and deferred test justifications where the licensee has demonstrated the impracticality of full-stroke exercising the listed valves quarterly and/or during cold shutdowns, deferral of this testing until cold shutdowns or refueling outages is covered by OM-10. Accordingly, the licensee's proposed alternate testing is in compliance with the Code. Cases where the licensee has not adequately demonstrated the impracticality of full-stroke exercising these valves quarterly and/or during cold shutdowns, are identified in Table 4.1 and in anomalies in Appendix A to this report.

Where full-stroke exercising is impractical quarterly and/or during cold shutdowns, OM-10 requires part-stroke exercising quarterly and/or during cold shutdowns if practical. Where full-stroke exercising is deferred until cold shutdowns or refueling outages, the licensee should part-stroke exercise the applicable valves as specified by OM-10, Paragraph 4.2.1.2 or 4.3.2.2, as appropriate.

4.3 Disassembly and Inspection

Several of the licensee's deferred test justifications propose check valve disassembly and inspection in lieu of full-stroke exercising the applicable valves open and/or closed with system pressure or flow. There are valves that cannot practically be verified to full-stroke exercise open and/or closed using system pressure or flow. Therefore, the staff approved the use of disassembly and inspection during refueling outages in GL 89-04 for those cases where it is impractical to verify a full-stroke exercise by testing.

OM-10, Paragraph 4.3.2.4(c), permits the use of disassembly and inspection to verify check valve obturator movement. This testing is to be performed at refueling outages, however, no provisions are made to allow use of a sampling program. GL 89-04, Position 2, provides guidelines for check valve disassembly and inspection on a sampling basis. This technique is approved for groups of identical valves in similar applications provided that it is performed in accordance with all of the provisions of the generic letter. This topic is also addressed in Appendix A, Item 3.

TABLE 4.1
DEFERRED TEST EVALUATIONS
SURRY POWER STATION, UNITS 1 AND 2

Item Number	Valve Identification	Justification for Deferring Valve Exercising	Proposed Alternate Testing	Evaluation of the Justification
CSV-1	Main steam line trip valves: 1(2)-MS-TV-101A, -101B, and -101C	Full-stroke or part-stroke exercising of these valves during power operation could result in a turbine and reactor trip.	These valves will be full-stroke exercised every cold shutdown but not more frequently than once every three months.	It is impractical to full-stroke exercise these valves quarterly. Therefore, the alternative is in accordance with ASME/ANSI O&M, Part 10, para. 4.2.1.
CSV-4 Part 1	AFW header check at main feedwater header valves: 1(2)-FW-27, -58, and -89 AFW header check valves at the containment penetrations: 1(2)-FW-131, -133, -136, -138, -272, -273, -309, and -310	Partial or full opening these valves during power operation would introduce cold AFW to the steam generators resulting in thermal stress and possible steam generator tube degradation.	These valves will be full-stroke exercised every cold shutdown but not more frequently than once every three months.	It is impractical to full-stroke exercise these valves quarterly. Therefore, the alternative is in accordance with Part 10, para. 4.3.2.
CSV-4 Part 2	AFW pump discharge check valves: 1(2)-FW-142, -157, and -172	Valves 1(2)-FW-142, 157 and 172 can be full-stroke tested every three months. To test these valves closed, flow must be established to the steam generators in order to back seat the valves on the discharge side of the non-running pumps. This test would introduce cold AFW to the steam generators if performed during normal operation.	These valves will be full-stroke tested once every three months and tested in the closed position every cold shutdown but not more frequently than once every three months.	It is impractical to exercise these valves closed quarterly. Therefore, the alternative is in accordance with Part 10, para. 4.3.2.
CSV-5	Component cooling to RHR heat exchanger check valves: 1(2)-CC-176 and -177 Component cooling to reactor containment air recirculation coolers: 1(2)-CC-242, -233, and -224	These valves are located in the containment and may be normally open or closed depending on system lineup. A containment entry and manipulation of other system valves are necessary to test these valves to either the open or closed position. This is considered impractical during power operation.	These valves will be tested in the closed position every cold shutdown but not more frequently than once every three months. Valves 1(2)-CC-176 and -177 will be full-stroke exercised every cold shutdown but not more frequently than once every three months.	It is impractical to exercise these valves closed quarterly. Therefore, the alternative is in accordance with Part 10, para. 4.3.2.

Item Number	Valve Identification	Justification for Deferring Valve Exercising	Proposed Alternate Testing	Evaluation of the Justification
CSV-6	Component cooling isolation valves to reactor coolant pumps: 1(2)-CC-1, -58, and -59 Component cooling isolation valves from the reactor coolant pumps: 1(2)-CC-TV-105A, -105B, and -105C	To perform an operability or a fail-safe test, the component cooling lines must be isolated, thereby stopping the flow of cooling water to the reactor coolant pumps. Loss of cooling water to these pumps can be damaging, even for short periods of time.	These valves will be tested in the closed position every cold shutdown when the reactor coolant pumps are secured but not more frequently than once every three months.	It is impractical to exercise these valves quarterly. Therefore, the alternative is in accordance with Part 10, para. 4.2.1.
CSV-7	Pressurizer power operated relief valves: 1(2)-RC-PCV-1456 and -1455C	These pressurizer power operated relief valves have shown a high probability of sticking open while being exercised during power operation. Also, these valves are not required for overpressure protection unless the primary system temperature is under 350°F per TS Para. 3.1.G.1.b(3).	These valves will be tested on approach to Cold Shutdown and testing shall not be deferred.	It is impractical to exercise these valves quarterly. Therefore, the alternative is in accordance with Part 10, paras. 4.2.1 and 4.3.2.
CSV-8	RHR pump discharge check valves: 1(2)-RH-5 and -11	These valves can only be partial or full-stroke exercised to the open position and verified closed during the testing of RHR pumps 1(2)-RH-P-1A and 1B (refer to Relief Request P-7). The low pressure pumps take suction from and discharge to the RCS which operates at 2235 psig. This pressure is well above the operating pressure of the pumps; therefore, testing during normal operation is not possible.	These valves will be tested to the full open position and the closed position during the testing of the RHR pumps (refer to Relief Request P-7).	It is impractical to exercise these valves closed quarterly. Therefore, the alternative is in accordance with Part 10, para. 4.3.2.
CSV-9	RHR suction from RCS isolation valves: 1(2)-RH-MOV-1700 and -1701	These valves are interlocked with RCS pressure such that the valves cannot be opened at elevated RCS pressure. Overpressurization of the suction line may cause a LOCA. The interlocks cannot be bypassed with normal control circuits.	These valves will be tested to the full open position every cold shutdown but not more frequently than once every three months.	It is impractical to exercise these valves quarterly. Therefore, the alternative is in accordance with Part 10, para. 4.2.1.

Item Number	Valve Identification	Justification for Deferring Valve Exercising	Proposed Alternate Testing	Evaluation of the Justification
CSV-10	RHR discharge to RCS isolation valves: 1(2)-RH-MOV-1720A and -1720B	With the MOV shut and if its respective check valve is leaking, there may be an undetected overpressure condition. If the MOV was opened and an overpressure condition did exist between the MOV and the RCS, the primary pressure of 2235 psig would be released to the RHR system with a relief valve setting of 600 psig. This would be an unnecessary challenge to the RHR system. Since the MOV is also part of the discharge piping of an accumulator, there is a possibility of discharging an accumulator into the RHR system and disabling it. The accumulators are maintained at pressure above the normal operating or shutdown pressure of the RHR system. Opening these valves would dump accumulator water into the RHR system, which could dilute the accumulator boron concentration and lower its level and pressure, which is a violation of TS.	These valves will be tested to the full open position every cold shutdown but not more frequently than once every three months.	It is impractical to exercise these valves quarterly. Therefore, the alternative is in accordance with Part 10, para. 4.2.1.
SV-11	Charging pump suction from volume control tanks isolation valves: 1(2)-CH-LCV-1115C and -1115E	Partial or full-stroke exercising these valves during power operation would require the charging pump suctions to be aligned with the refueling water storage tank. This would cause a sudden increase in RCS boron inventory, which would cause a plant transient.	These valves will be tested to the closed position every cold shutdown but not more frequently than once every three months.	It is impractical to exercise these valves quarterly. Therefore, the alternative is in accordance with Part 10, para. 4.2.1.
CSV-13	Reactor coolant pump seal water return line isolation valve: 1(2)-CH-MOV-1381	Closure of this valve with Reactor Coolant Pumps in operation will cause a loss of seal flow resulting in possible pump seal damage.	This valve will be tested to the closed position every cold shutdown.	It is impractical to exercise these valves quarterly. Therefore, the alternative is in accordance with Part 10, para. 4.2.1.
CSV-14	RHR heat exchanger flow control valves: 1(2)-RH-FCV-1605 and -1758	These valves have no remote position indication and are located inside containment. The valves can only be exercised (partial or full-stroke) and timed by locally observing stem movement. Because a containment entry is required to perform the exercise and fail-safe tests, it will be conducted every cold shutdown.	1(2)-RH-FCV-1605 will be tested to the closed position, and valve 1(2)-RH-HCV-1758 will be tested to the full open position every cold shutdown but not more frequently than once every 3 months.	It is impractical to exercise these valves quarterly. Therefore, the alternative is in accordance with Part 10, para. 4.2.1.

Item Number	Valve Identification	Justification for Deferring Valve Exercising	Proposed Alternate Testing	Evaluation of the Justification
CSV-15	RCS letdown isolation trip and level control valves: 1(2)-CH-TV-1204A, -1204B, 1(2)-CH-LCV-1460A, and -1460B	Exercising these valves during power operation interrupts letdown flow from the RCS to the volume control tank. If the valves should fail closed, reactor coolant inventory control would be lost. The pressurizer level control program controls reactor coolant inventory by regulating the operation of the charging flow control valve so that the charging input flow to the RCS and reactor coolant pump seal injection flow into the RCS matches letdown flow. Also, exercising these valves during normal operation will interrupt letdown flow through the regenerative heat exchanger. This flow interruption would allow a slug of relatively cool charging water to thermal shock the nozzle connecting the 3" charging line to the 27" loop 2 cold leg injection line. The valve controllers do not allow for a part-stroke exercise test.	These valves will be tested to the closed position every cold shutdown but not more frequently than once every three months.	It is impractical to exercise these valves quarterly. Therefore, the alternative is in accordance with Part 10, para. 4.2.1.
CSV-16	Normal charging header isolation valves: 1(2)-CH-MOV-1289A and -1289B	Failure of these valves in the closed position during exercising would cause a loss of charging flow and could result in an inability to maintain reactor coolant inventory.	These valves will be tested to the closed position every cold shutdown but not more frequently than once every three months.	It is impractical to exercise this valve quarterly. Therefore, the alternative is in accordance with Part 10, para. 4.2.1.
CSV-17	Low head safety injection (LHSI) to RCS cold legs isolation valve: 1(2)-SI-MOV-1890C	In accordance with TS 3.3.A.8, during power operation, the A.C. power shall be removed from 1(2)-SI-MOV-1890C with the valve in the open position. If this valve was stroked during power operation and failed in the closed position, the LHSI system would be rendered inoperable.	This valve will be tested to the full open and closed positions every cold shutdown but not more frequently than once every three months.	It is impractical to exercise this valve quarterly. Therefore, the alternative is in accordance with Part 10, para. 4.2.1.
CSV-18	High head safety injection (HHSI) isolation valves: 1(2)-SI-MOV-1867C and -1867D	These valves cannot be partial or full-stroke exercised during power operation. Opening these valves would allow excess charging flow into the RCS causing a reactivity transient.	These valves will be tested to the full open and closed positions every cold shutdown but not more frequently than once every three months.	It is impractical to exercise these valves quarterly. Therefore, the alternative is in accordance with Part 10, para. 4.2.1.

Item Number	Valve Identification	Justification for Deferring Valve Exercising	Proposed Alternate Testing	Evaluation of the Justification
CSV-19	Emergency and manual emergency boration line isolation valves: 1(2)-CH-225, -227, -228, -229, and 1(2)-CH-MOV-1350	To achieve full flow through check valves 1(2)-CH-225, -227 and -229, the boric acid transfer pumps must be set at high speed, which could inject enough boric acid into the RCS to cause a reactor power transient. Under normal plant operating conditions or when the plant is shutdown, 1(2)-CH-MOV-1350 can be full-stroke exercised and valves 1(2)-CH-225, 227 and 229 can be part-stroked exercised with the boric acid transfer pumps set on low speed to minimize the amount of boric acid injected into the RCS. However, during power operation when the concentration of boric acid in the RCS is low, the addition of boric acid will produce an undesirable transient in reactor power. Low concentrations of boric acid occur near the end of the fuel cycle.	1(2)-CH-MOV-1350 will be exercised and check valves 1(2)-CH-225, -227 and -229 will be full-stroked exercised every quarter during normal operation when the RCS boric acid concentration is above 100 ppm. Manual valve 1(2)-CH-228 will be stroked open when the other valves in the alternate boration path are exercised. The increased level of safety gained by exercising this valve quarterly is not justified by the added burden of performing a separate test just for the manual valve.	It is impractical to exercise these valves quarterly. Therefore, the alternative is in accordance with Part 10, paras. 4.2.1 and 4.3.2.
CSV-21	Steam generator blowdown isolation valves: 1(2)-BD-TV-100A, -100B, -100C, -100D, -100E, and -100F	Closing these valves during power operation causes the downstream piping to become empty due to drainage and water flashing to steam. When the valves reopen, a flow surge could occur which automatically isolates the inner valves due to high flow. Then a containment entry is necessary to reset these valves and upon reopening the process may occur again.	These valves will be tested to the closed position every cold shutdown but not more frequently than once every three months.	It is impractical to exercise these valves quarterly. Therefore, the alternative is in accordance with Part 10, para. 4.2.1.
CSV-25	HHSI to the RCS isolation valves: 1(2)-SI-MOV-1842, -1869A, and -1869B	These valves cannot be partial or full-stroke exercised during power operation. Opening these valves would allow excess charging flow into the RCS causing a reactivity transient and possible thermal shock to the HHSI system. Also, according to TS 3.3.A.9, A.C. power shall be removed with the valves in the closed position during power operation.	These valves will be tested to the full open and closed positions every cold shutdown but not more frequently than once every three months.	It is impractical to exercise these valves quarterly. Therefore, the alternative is in accordance with Part 10, para. 4.2.1.

Item Number	Valve Identification	Justification for Deferring Valve Exercising	Proposed Alternate Testing	Evaluation of the Justification
CSV-26	Component cooling supply and return for the RHR heat exchanger isolation valves: 1(2)-CC-181 and -185	A containment entry is required to exercising these manual butterfly valves. Therefore, they will be exercised every cold shutdown.	These valves will be tested to the full open and closed positions every cold shutdown but not more frequently than once every three months.	It is impractical to exercise these valves quarterly. Therefore, the alternative is in accordance with Part 10, para. 4.2.1.
CSV-27	Component cooling return from reactor coolant pump thermal barrier isolation valves: 1(2)-CC-TV-120A, -120B, -120C, -140A, and -140B	Exercising these valves during normal operation would isolate component cooling water to the reactor coolant pump thermal barriers. Cooling water must be available to the reactor coolant pump thermal barriers when the RCS temperature is above 200°F. Cold shutdown is entered when the RCS temperature drops below 200°F. The valve controllers do not allow for a part-stroke exercise test.	These valves will be tested to the closed position every cold shutdown but not more frequently than once every three months.	It is impractical to exercise these valves quarterly. Therefore, the alternative is in accordance with Part 10, para. 4.2.1.
CSV-28	Main feedwater regulating and regulating bypass isolation valves: 1(2)-FW-FCV-1478, -1488, -1498, -155A, -155B, and -155C	These valves are in positions required to sustain power operation. Full-stroke exercising the valves would result in a reactor trip. The main feedwater regulating valves 1(2)-FW-FCV-1478, -1488 and -1498 move during normal operation as they perform their regulating function. The bypass valves 1(2)-FW-FCV-155A, B and C are used only during plant startup. During this startup period, their safety function is to close. During normal operation, these valves remain closed and, thus are passive in the closed position. Therefore, the bypass valves do not need to be part-stroke tested every three months.	These valves will be full-stroke exercised every cold shutdown but not more frequently than once every three months. The main feedwater regulating valves will be part-stroke exercised every three months during the turbine inlet valve movement test.	It is impractical to exercise these valves quarterly. Therefore, the alternative is in accordance with Part 10, para. 4.2.1.
CSV-29	SI accumulator discharge isolation check valves: 1(2)-SI-109, -130, and -147	These check valves are located inside containment and are back seat tested using the installed sampling system. To ensure that all of the leakage that could pass by the check valves is collected, the accumulator discharge motor operated valves must be closed. However, these motor operated valves must be open and de-energized when the RCS pressure is above 1000 psig according to TS 3.3.A.10.	The accumulator check valves will be tested to the closed position every cold shutdown but not more frequently than once every three months.	It is impractical to exercise these valves closed quarterly. Therefore, the alternative is in accordance with Part 10, para. 4.3.2.

Item Number	Valve Identification	Justification for Deferring Valve Exercising	Proposed Alternate Testing	Evaluation of the Justification
CSV-30	Charging pump seal cooling surge tank makeup check valve: 1(2)-CC-805	This valve must open to provide a flow path from the component cooling water system to the charging pump seal water surge tank as a supply of makeup water to the surge tank. There is no flow instrumentation to verify partial or full flow for the check valve. There is level instrumentation on the surge tank. The surge tank can be isolated, drained down and refilled. However, the surge tank provides the NPSH for the charging pump cooling water pumps and it should not be isolated from the system during normal operation when component cooling water for the charging pumps is required.	This valve will be tested to the full open position every cold shutdown but not more frequently than once every three months.	It is impractical to exercise this valve quarterly. Therefore, the alternative is in accordance with Part 10, para. 4.3.2.
CSV-31	Charging pump seal cooling surge tank level control valve: 1(2)-CC-LCV-101	This valve must open to maintain the level in the charging pump seal water surge tank and must close to prevent overflowing the surge tank and potentially draining the surge tank through the over flow line. The valve fails closed on loss of operating air. Valve position is determined solely from tank level. In order to manipulate the valve for testing, the surge tank must be isolated. However, the surge tank provides the NPSH for the charging pump cooling water pumps and it should not be isolated from the system during normal operation when component cooling water for the charging pumps is required.	This valve will be exercise to the open and closed positions every cold shutdown but not more frequently than once every three months.	It is impractical to exercise this valve quarterly. Therefore, the alternative is in accordance with Part 10, para. 4.2.1.

Item Number	Valve Identification	Justification for Deferring Valve Exercising	Proposed Alternate Testing	Evaluation of the Justification
CSV-32	Main steam non-return valves: 1(2)-MS-NRV-101A, -101B, and -101C	Full or part-stroke exercising these valves during power operation would result in a turbine and reactor trip. Plant cooldown procedures require the trip valve to be closed, and then the NRV stem run down onto the disk to isolate the main steam system. The VOTES testing must be performed when the NRVs are initially closed during the cooldown to accurately assess the piston-disk assembly's as-found position. The VOTES test will delay the cooldown process from between one to two hours. Some cold shutdown outages are forced outages that result from exceeding a TS limit such as unidentified RCS leakage. The emphasis in a forced outage cooldown is to reach cold shutdown as rapidly as possible and to mitigate the cause of the forced outage. Stopping this process to perform the VOTES test would complicate the operators task to secure the plant and may reduce plant safety. There is no evidence in the valve history that a valve has stuck in the partial open position. The piston-disk assembly is not attached to any other internal part, the 1,200 lb piston-disk assembly is maintained parallel within the valve body cylinder and the main steam system is very clean. Consequently, there no mechanism to prevent the disk from dropping from the full open position to the valve seat.	The VOTES test will be performed on each main steam non-return valve during the cooldown process going into each planned cold shutdown. This test will not be performed more often then once every three months.	It is impractical to exercise these valves quarterly. Therefore, the alternative is in accordance with Part 10, para. 4.3.2.
CSV-33	Head vent valves for the reactor vessel: 1(2)-RC-SOV-100A-1 -100A-2, -100B-1, and -100B-2	These valves isolate the reactor vessel from containment atmosphere. Partial or full-stroke exercising the valves during normal operation or during cold shutdowns where the RCS is pressurized could result in the release of uncontrolled contamination to containment.	This valve will be exercise to the open and closed positions during cold shutdowns when the RCS is not pressurized but not more frequently than once every three months.	It is impractical to exercise these valves quarterly. Therefore, the alternative is in accordance with Part 10, para. 4.2.1.

Item Number	Valve Identification	Justification for Deferring Valve Exercising	Proposed Alternate Testing	Evaluation of the Justification
RRV-1	Charging pump discharge check valves: 1(2)-CH-258, -267, and -276	With the present plant design, these valves can only be part-stroke exercised during power operation because the charging pumps cannot achieve design accident flow when pumping into the RCS at operating pressure. The only available flow path to test these valves is into the RCS. During cold shutdown, stroke exercising these valves could result in an overpressurization of the RCS and could force a safety system to function.	These valves will be part-stroked every three months and full flow tested each refueling.	It is impractical to full-stroke exercise these valves quarterly or during cold shutdowns. Therefore, the alternative is in accordance with Part 10, para. 4.3.2.
RRV-2	LHSI pump suction from RWST check valves: 1(2)-SI-46A and -46B LHSI pump discharge check valves: 1(2)-SI-50 and -58	These valves cannot be full-stroke exercised during plant power operation. The only full flow path is into the RCS and LHSI pumps cannot overcome RCS operating pressure. These valves will be part-stroked every three months through the pump recirculation line. During cold shutdown, the RCS pressure still prevents full flow testing of the check valve. During cold shutdown, the charging flow could cause an overpressurization condition. Testing valves I-SI-50 and 58 to the closed position requires isolating the suction lines to the LHSI pumps, venting the upstream side of the valve being tested, starting the pump on the other path, checking for leakage and then repeating the process for the other valve. This test can take up to a hour to complete and places the unit into a LCO per TS 3.3 if performed during normal operation.	These valves will be part-stroked every three months and full-stroked every refueling. Valves 1(2)-SI-50 and 58 will be tested to the closed position every cold shutdown.	It is impractical to exercise these valves quarterly or during cold shutdowns. Therefore, the alternative is in accordance with Part 10, para. 4.3.2.

Item Number	Valve Identification	Justification for Deferring Valve Exercising	Proposed Alternate Testing	Evaluation of the Justification
RRV-3	Accumulator discharge check valves: 1(2)-SI-107, -109, -128, -130, -145, and -147	These valves cannot be partial or full flow tested during normal operation because the accumulator pressure (600 to 650 psig) is below RCS pressure and the injection of borated water would upset the reactor coolant chemistry. During cold shutdown, the RCS pressure still prevents full flow testing. To achieve full flow through the valves during reactor refueling, the accumulator would have to be discharged from an initial pressure of 600 psig. Discharging the accumulator from this pressure would stress the piping system and inject nitrogen into the RCS. Nitrogen in the RCS has been linked to gas binding of the RHR pumps. However, the accumulator can be discharged from a lower pressure during reactor refuelings when the RCS is depressurized. At this pressure, full flow conditions will not be established; however, enough flow will be developed to open the check valves to the full open position. This event can be verified and documented using nonintrusive diagnostic techniques.	Nonintrusive diagnostic techniques will be used to determine that the check valves open to the full open position. A sampling program will be applied to the nonintrusive techniques as described in Relief Request V-26.	It is impractical to exercise these valves quarterly or during cold shutdowns. Therefore, the alternative is in accordance with Part 10, para. 4.3.2.

Item Number	Valve Identification	Justification for Deferring Valve Exercising	Proposed Alternate Testing	Evaluation of the Justification
RRV-4 Part 1	Safety injection to RCS cold legs check valves: 1(2)-SI-79, -82, and -85 LHSI to RCS cold legs check valves: 1(2)-SI-241, -242, and -243	The valves on the HHSI paths cannot be partial or full-stroke exercised to the open position during power operation because flow through these valves would thermal shock the injection system and cause unnecessary plant transients. Flow cannot be established in the valves on the LHSI paths during power operation because the LHSI pumps do not develop sufficient head to overcome RCS pressure. During cold shutdown, exercising the HHSI path valves with flow could cause a low temperature overpressurization of the RCS and force a safety system to function. Because of the large flow rate (3000 gpm) produced by the LHSI pumps, exercising the LHSI path valves during cold shutdowns when the reactor head is bolted in place presents the risk of filling the pressurizer and overflowing through a pressure operated relief valve into the pressurizer relief tank. Therefore, it is impractical to exercise the high or the LHSI path valves with flow quarterly or during cold shutdowns. To individually verify closure for these valves the piping must be vented upstream and a backseat test performed. These valves are located inside the containment and would require a subatmospheric containment entry to perform the backseat test if the reactor is above 200°F. Therefore, it is impractical to perform a closure test every quarter. These valves are designated as pressure isolation valves.	Valves 1(2)-SI-79, 82, 85, 241, 242 and 243 will be tested to the closed position per the requirements of TS Table 4.1-2A. TS Table 4.1-2A requires that periodic leakage testing on each of these valves be accomplished prior to entering power operation condition after each time the plant is placed in the cold shutdown condition for refueling and after each time the plant is placed in cold shutdown condition for 72 hours if testing has not been accomplished in the proceeding 9 months.	It is impractical to exercise these valves quarterly or during cold shutdowns. Therefore, the alternative is in accordance with Part 10, para. 4.3.2.

Item Number	Valve Identification	Justification for Deferring Valve Exercising	Proposed Alternate Testing	Evaluation of the Justification
RRV-4 Part 2	Safety injection to RCS hot legs check valves: 1(2)-SI-88, -91, -94, -238, -239, and -240	The valves on the HHSI paths cannot be partial or full-stroke exercised to the open position during power operation because flow through these valves would thermal shock the injection system and cause unnecessary plant transients. Flow cannot be established in the valves on the LHSI paths during power operation because the LHSI pumps do not develop sufficient head to overcome RCS pressure. During cold shutdown, exercising the HHSI path valves with flow could cause a low temperature overpressurization of the RCS and force a safety system to function. Because of the large flow rate (3000 gpm) produced by the LHSI pumps, exercising the LHSI path valves during cold shutdowns when the reactor head is bolted in place presents the risk of filling the pressurizer and overflowing through a pressure operated relief valve into the pressurizer relief tank. Therefore, it is impractical to exercise the high or the low head injection path valves with flow quarterly or during cold shutdowns. Individual valve closure cannot be verified for these valves. There are no drains between the valve pairs 1(2)-SI-88 and -238, 1(2)-SI-91 and -239, and 1(2)-SI-94 and -240. To verify closure for each pair of valves, a subatmospheric containment entry must be made and a backseat test performed if the reactor is above 200°F. Therefore, it is impractical to perform a closure test every quarter. A leakage test will be performed on each of the three pairs of valves on the same test frequency as the pressure isolation valves.	The valve pairs 1(2)-SI-88 and 1(2)-SI-238, and 1(2)-SI-91 and 1(2)-SI-239, and 1(2)-SI-94 and 1(2)-SI-240 will be tested for leakage to confirm that the valve pairs provide isolation for the three hot leg injection paths. The leakage tests will be performed at the frequency required by TS Table 4.1-2A. Individual valve verification to the closed position is not possible with the current line configurations.	It is impractical to exercise these valves quarterly or during cold shutdowns. Therefore, the alternative is in accordance with Part 10, para. 4.3.2.

Item Number	Valve Identification	Justification for Deferring Valve Exercising	Proposed Alternate Testing	Evaluation of the Justification
RRV-4 Part 3	HHSI to RCS cold legs check valves: 1(2)-SI-235, -236, and -237	The valves on the HHSI paths cannot be partial or full-stroke exercised to the open position during power operation because flow through these valves would thermal shock the injection system and cause unnecessary plant transients. During cold shutdown, exercising the HHSI path valves with flow could cause a low temperature overpressurization of the RCS and force a safety system to function. Therefore, it is impractical to exercise the HHSI path valves with flow quarterly or during cold shutdowns. To verify closure for these valves a subatmospheric containment entry must be made and a backseat test performed if the reactor is above 200°F. Therefore, it is impractical to perform a closure test every quarter. In lieu of performing a backseat test on each of these valves every cold shutdown, a leakage test will be performed on each valve. This test will be performed on the same frequency as the pressure isolation valves (i.e., per TS Table 4.1-2A).	Valves 1(2)-SI-235, 236 and 237 will be tested for leakage to confirm that the valves are in the closed position. The leakage tests will be performed at the frequency required by TS Table 4.1-2A.	It is impractical to exercise these valves quarterly or during cold shutdowns. Therefore, the alternative is in accordance with Part 10, para. 4.3.2.

Item Number	Valve Identification	Justification for Deferring Valve Exercising	Proposed Alternate Testing	Evaluation of the Justification
RRV-4 Part 4	HHSI check valves at containment penetrations: 1(2)-SI-224, -225, -226, and -227 LHSI check valves at containment penetrations: 1(2)-SI-228 and -229	The valves on the HHSI paths cannot be partial or full-stroke exercised to the open position during power operation because flow through these valves would thermal shock the injection system and cause unnecessary plant transients. Flow cannot be established in the valves on the LHSI paths during power operation because the LHSI pumps do not develop sufficient head to overcome RCS pressure. During cold shutdown, exercising the HHSI path valves with flow could cause a low temperature overpressurization of the RCS and force a safety system to function. Because of the large flow rate (3000 gpm) produced by the LHSI pumps, exercising the LHSI path valves during cold shutdowns when the reactor head is bolted in place presents the risk of filling the pressurizer and overflowing through a pressure operated relief valve into the pressurizer relief tank. Therefore, it is impractical to exercise the HHSI or the LHSI path valves with flow quarterly or at cold shutdowns.	Full-stroke exercise with flow every reactor refueling outage.	It is impractical to exercise these valves quarterly or during cold shutdowns. Therefore, the alternative is in accordance with Part 10, para. 4.3.2.
RRV-5	Charging pump suction from the RWST cross tie check valves: 1(2)-SI-25 and -410	Exercising these valves during power operation would require the charging pump suctions to be aligned with the refueling water storage tank. This would cause a sudden increase in reactor coolant boron inventory. Full flow for the charging system can only be established during reactor refueling when the RCS is depressurized. Valve 1(2)-SI-25 must close to preserve inventory from the Unit 2 RWST when the cross tie lines are opened. There are no vents or pressure instrumentation upstream of the valve; therefore, the valve cannot be backseat tested with flow.	These valves will partial flow tested during every cold shutdown and full flow tested during every reactor refueling. Valve 1(2)-SI-25 will be disassembled and inspected every refueling outage to verify closure.	It is impractical to exercise these valves quarterly or during cold shutdowns. Therefore, the alternative is in accordance with Part 10, para. 4.3.2.

Item Number	Valve Identification	Justification for Deferring Valve Exercising	Proposed Alternate Testing	Evaluation of the Justification
RRV-6	Various check valves that perform a CIV function and are located inside containment.	These check valves must seat upon reversal of flow in order to fulfill their safety functions. The only way to verify closure is to perform a local leak rate/back pressure test. Since the valves are located inside containment, they cannot be tested quarterly. These valves are containment isolation valves and are subject to leak testing every reactor refueling outage per the requirements of the Appendix J leak testing program and OM Part 10, Paragraphs 4.2.2.3(e) and (f). The leak tests not only verify that the valves close adequately as does a normal back pressure test, but the tests also reveal the condition of the valve seating surfaces. As required by Paragraph 4.2.2.3(e), the leak tests include acceptance criteria for the maximum allowed leakage. Performing a back seat test every cold shutdown does not provide enough increase in safety to justify the burden of back seat testing on a more frequent basis.	Exercise to the closed position every reactor refueling.	It is impractical to exercise these valves quarterly or during cold shutdowns. Therefore, the alternative is in accordance with Part 10, para. 4.3.2.

Item Number	Valve Identification	Justification for Deferring Valve Exercising	Proposed Alternate Testing	Evaluation of the Justification
RRV-7	Component cooling supply to RCP thermal barrier isolation check valves: 1(2)-CC-1105, -1106, -1107, -1188, -1189, and -1190	These check valves must seat upon reversal of flow in order to fulfill their safety function to prevent gross leakage. For the following reasons, it is not practical to test the thermal barrier check valves quarterly or at cold shutdown: 1) the valves are inside a locked radiation area located inside containment; therefore, they are not accessible during normal operation, 2) the valves are inaccessible for about 24 hours after cold shutdown due to decontamination activities which must be performed before entry into the area, 3) the reactor cooling pump(s) may be running with the reactor cooling system temperature less than 200°F if an RHR loop is unavailable (in this case the valves and thus cooling to the thermal barriers would normally not be isolated) and 4) the valves have soft seats that are replaced every five years and using pressure to back seat these valves on the more frequent cold shutdown frequency may accelerate the degradation of the soft seats. These valves will be exercised only during refueling outages because the small increase in safety gained by performing this test every cold shutdown does not justify the burden of performing a local back pressure test.	Exercise to the closed position every reactor refueling.	It is impractical to exercise these valves quarterly or during cold shutdowns. Therefore, the alternative is in accordance with Part 10, para. 4.3.2.

Item Number	Valve Identification	Justification for Deferring Valve Exercising	Proposed Alternate Testing	Evaluation of the Justification
RRV-8	Charging pump supply from the VCT discharge check valve: 1(2)-CH-230	During normal operation, this valve cannot be isolated to perform a back pressure test because normal letdown and charging flow would be interrupted. Also, if the valve was isolated during normal operation, the charging pumps would have to be secured. This valve is also subject to leak testing, which is performed every reactor refueling. Verification of closure will be performed during the leak test every reactor refueling instead of every cold shutdown because the small increase in safety gained by testing during cold shutdown does not justify performing a leak rate test.	Verification of closure will be performed during the leak test every reactor refueling outage.	It is impractical to exercise these valves quarterly or during cold shutdowns. Therefore, the alternative is in accordance with Part 10, para. 4.3.2.

APPENDIX A

IST PROGRAM ANOMALIES

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Anomalies or inconsistencies found during the evaluation are given below. These anomalies summarize concerns with the IST program that require additional actions by the licensee for resolution. The licensee should resolve these items as indicated.

1. The IST program does not include a description of how the components were selected and how testing requirements were identified for each component. The review performed for this Safety Evaluation (SE)/TER did not include verification that all pumps and valves within the scope of 10 CFR 50.55a and Section XI are contained in the IST program, and did not ensure that all applicable testing requirements have been identified. Therefore, the licensee is requested to include this information in the IST program. The program should describe the development process, such as a listing of the documents used, the method of determining the selection of components, the basis for the testing required, the basis for categorizing valves, and the method or process used for maintaining the program current with design modifications or other activities performed under 10 CFR 50.59.

2. Several of the licensee's relief requests (V-5, -20, -43, and -50) are approved by GL 89-04 and are not evaluated in this TER. The licensee indicates compliance with GL 89-04, but does not specifically address all aspects of the Generic Letter provisions in the requests. In these cases, it is assumed that the licensee is complying with all of the requirements of the applicable GL 89-04 positions. Relief is not granted for the above relief requests for testing that deviates from that prescribed in GL 89-04. Whether the licensee complies with the provisions of GL 89-04 is subject to NRC inspection. If the licensee intends to deviate from a GL 89-04 position, a revised relief request specifically stating the deviation from GL 89-04 guidance must be submitted for review and approval prior to implementing the testing.

   For example, it does not appear that valves 1(2)-SW-108, -113, and -130 in relief request V-50 meet the grouping criteria of GL 89-04, Position 2. Valves 1-SW-108 and -113 are Code Class 3 valves and are at the discharge of the charging pump service water pumps. Check valve 1-SW-130 is a non-Code Class valve that is in the combined return line to the circulating water discharge tunnel. The licensee should disassemble and inspect valve 1-SW-130 as a separate group or revise request V-50 to justify the deviation from the GL 89-04 grouping criteria.

3. Valve relief requests V-5, -20, -41, -42, -43, -46, and -50 are for check valves that may not be practically verified closed using system pressure or flow or full-stroke exercised open with flow per GL 89-04, Position 1. The licensee proposes to full-stroke exercise these valves by sample disassembly, inspection, and a manual exercise. The NRC considers valve disassembly and inspection to be a maintenance procedure and not a test equivalent to the exercising produced by fluid flow. This procedure has some risk, which make its routine use as a substitute for testing undesirable when some method of testing is possible. Disassembly and inspection, to

verify the full-stroke open or closure capability of check valves is not a recommended option when exercising can be practically performed by system pressure, flow, or other positive means. Check valve disassembly is a valuable maintenance tool that can provide much information about a valve's internal condition and as such should be performed under the maintenance program at a frequency commensurate with the valve type and service.

Some test method may be feasible to full-stroke exercise these valves. The licensee should consider methods such as using nonintrusive techniques (e.g., acoustics, ultrasonics, magnetics, radiography, and thermography) to verify a full-stoke exercise of the subject check valves. This testing may only be practical at cold shutdowns or refueling outages. The licensee should perform their investigation and if a test method is found to be practicable, the IST requirements of the applicable valves should be satisfied by testing instead of disassembly and inspection. If testing is not practicable and disassembly and inspection is used, it must be performed in accordance with GL 89-04, Position 2. The licensee should respond to this concern.

4. In relief request P-1 (see Section 2.1.1.1) the licensee requests relief from the pump vibration measurement reference value requirements for all pumps in the IST program. The licensee proposes to set the vibration velocity reference values for pumps with a measured vibration velocity below 0.05 in/sec. at 0.05 in/sec. The alternative is authorized on an interim basis pursuant to 10 CFR 50.55a(a)(3)(ii) with the following provision. Prior to assigning the 0.05 in/sec. as a minimum reference value, the licensee should review each application and the manufacturers' recommendations to ensure that the proposed minimum reference value is appropriate. Once the OM Code Committee comes to a consensus and changes the Code with guidance for smoothly-running pumps, the licensee should adopt the guidance or develop and justify a reasonable alternative to the Code.

5. In relief request P-11 (Unit 1) (see Section 2.3.1.1) the licensee requests relief from the reference value and differential pressure (d/p) measurement requirements for the emergency service water pumps. The licensee proposes to conduct tests of these pumps within the tide level limits of a pump reference curve. The pump flow will be compared to acceptance criteria based on the reference curve and the ranges given in OM Part 6, Table 3b. Discharge pressure will not be measured. Testing using a reference curve can be acceptable if the seven elements listed in Section 2.3.1.2 are incorporated into the IST program and procedures for developing and implementing the curve(s). However, traditional curve testing does not appear to be feasible in this case, as this is a fixed-resistance system with no provision for varying d/p or Q.

Given that traditional curve testing may not be appropriate, and considering the limited information provided in the relief request regarding the licensee's approach to curve testing, the reviewer cannot fully assess the proposal and determine whether relief should be granted or the alternative authorized as provided for in 10 CFR 50.55a. The licensee's proposed testing gains information that can be considered to assess the operational readiness of these pumps. Therefore, their proposal provides an adequate alternative to the Code requirements for an interim period. Interim relief should be authorized pursuant to 10 CFR 50.55a(f)(6)(i) for a period of one year or until the next refueling outage, whichever is longer. Relief should not be authorized beyond that point. By the end of that period the licensee should either comply with the Code or develop and a method of monitoring the condition of these pumps that provides a reasonable alternative to the Code. The proposed method, if different than the Code should be submitted to the NRC for review and approval.

6. In relief request P-16 (Unit 1) (see Section 2.4.1.1) the licensee requests interim relief from the requirements to measure and evaluate Q for the main control room (MCR) air conditioning pumps. The licensee proposes to determine pump Q by measuring the d/p across the chiller condensers. The alert value will be set at 10% above the minimum Q (240 gpm) or 264 gpm. The pump will be declared inoperable if a Q of 240 gpm cannot be achieved via system adjustments. Additionally, if a pump discharge pressure of at least 30 psig cannot be achieved with a shut backwash valve, the system and pump will be investigated. Inlet pressure and Q measuring instruments will be installed by the end of the Unit 1, cycle 12 refueling outage, which is scheduled for the second quarter of 1994. Once the modifications are made, the licensee will comply with the Code requirements. Interim relief should be authorized pursuant to 10CFR50.55a(f)(6)(i) for a period of one year or until the next refueling outage, whichever is longer. Relief should not be granted beyond that point. By the end of that period the licensee should either comply with the Code or develop and implement a method of monitoring the condition of these pumps that provides a reasonable alternative to the Code.

7. In relief request P-17 (Unit 1) (see Section 2.4.2.1) the licensee requests relief from the requirement to obtain reference values at repeatable points of operation for the MCR air conditioning system chilled water circulating pumps. The licensee proposes to use a straight line approximation method to determine d/p reference points as a function of flow between the two test points. The measured d/p will be compared to the upper required action limit which is set at 110% of the reference d/p (P_{rdiff}), and the lower required action limit at 90% of P_{rdiff}. No alert range will be assigned. Relief should be granted from this Code requirement pursuant to 50.55a(f)(6)(i) with the following provision. The licensee should follow the seven guidelines identified in Section 2.3.1.1.2 of this report for using reference curves, if practicable. Where it is not practicable to follow these guidelines, the licensee should identify the specifics of their alternative and justify the deviations and show the adequacy of their proposed testing.

8. In relief requests P-16 (Unit 2) and P-19 (Unit 1) (see Section 2.5.1.1) the licensee requests interim relief from the requirement to measure flow and differential pressure at repeatable points of operation for the component cooling pumps. The licensee proposes to use a straight line approximation method to determine d/p reference points as a function of flow between the two test points. The measured d/p will be compared to the upper required action limit, which is set at 110% of P_{rdiff}, and the lower required action limit at 90% of P_{rdiff}. No alert range will be assigned. Relief should be granted from this Code requirement pursuant to 50.55a(f)(6)(i) with the

following provision. The licensee should follow the seven elements identified in the preceding paragraph for using reference curves, if practicable. Where it is not practicable to follow these guidelines, the licensee should identify the specifics of their alternative and justify the deviations and show the adequacy of their proposed testing.

9. V-47 requests relief from the stroke time measurement method and acceptance criteria requirements of OM-10 for the listed valves and proposes to measure the stroke times of these valves by observing the valve stems locally and not apply the acceptance criteria of Paragraph 4.2.1.8. The licensee's proposed testing provides a relatively inaccurate measurement of valve stroke times. The measurement inaccuracies and relaxed acceptance criteria decrease the likelihood of detecting degradation unless the valve is sufficiently degraded that the limiting value of full-stroke time is exceeded. Position 5 of GL 89-04 provides guidance for developing limiting values of full-stroke times for power-operated valves. If these limits are not set in accordance with these guidelines, the proposed testing is incapable of detecting degradation and is unacceptable.

   If not already done, the licensee should investigate alternate testing methods that could provide more accurate measurements of stroke times for these valves. These methods could range from procedural changes (e.g., removing a power source to a controller or using calibration equipment to insert a signal that would cause a valve to move to its open or closed position at maximum speed) to using nonintrusive diagnostics to measure the stroke times (e.g., using a hall-effect probe or gauss detector to detect when current is interrupted to a solenoid valve coil and detect when the slug has moved from the seat into the coil). If a more accurate test method is found to be practicable, it should be employed to test the applicable valves. Valve diagnostic programs can yield significant information about the valve assembly, including the valve and actuator. When meaningful inservice testing is impractical, a periodic verification performed using valve diagnostic techniques may be an adequate alternative method for monitoring these valves for degrading conditions. Therefore, this alternative can ensure an acceptable level of quality and safety if the licensee has an established program of periodic diagnostic testing. (See Section 3.1.1.1)

10. V-51 requests relief from the leak rate corrective action requirements of OM-10 for all CIVs in the IST program and proposes to allow an evaluation of leakage rates above the allowable limits instead of repair or replacement as long as the overall containment leakage is less than $0.6L_a$. The licensee did not provide details about the evaluation that would be performed. The evaluations should be performed in a manner that provides a high level of assurance that delaying the repair or replacement of valves with high leakage rates will not result in exceeding the $0.6L_a$ limit before the next leakage rate tests. The licensee should document in the program plan how these evaluations will be performed and what will be included (see Section 3.1.2.1).

11. V-26 requests relief from the test frequency requirements of OM-10 for the accumulator discharge check valves, 1(2)-SI-107, -109, -128, -130, -145, and -147, and proposes to verify a full-stroke exercise of these valves using nonintrusive

techniques on a sampling basis during refueling outages. The licensee's proposed alternate testing appears to comply with most of the guidelines for using nonintrusives on a sampling basis in Section 3.2.1.1.1 of this report, however, it is unclear from the submittal if all of these conditions are met. The licensee should verify that the testing of the subject valves complies with all of these guidelines. The proposed grouping in this request does not appear to comply with the GL 89-04 requirement that group valves have the same service conditions. Valve 1(2)-SI-109 is the second check valve (closer to the RCS) in the injection line from the accumulator to the RCS while the other three group valves are the first check valves (closer to the accumulators). Differences in service conditions may affect the corrosion, erosion, wear, etc. for this valve such that it is not representative of the other valves in the proposed group. The licensee should justify the proposed grouping or bring it into compliance with the grouping criteria of GL 89-04.

12. V-27 requests relief from the exercising method requirements of OM-10 for the safety injection to RCS hot legs check valves and proposes to exercise these valves closed as pairs instead of individually at the frequency described in TS Table 4.1-2A. The licensee's proposed alternate testing appears to comply with several of the conditions for testing series check valves as pairs listed in Section 3.2.1.2.1 of this report, however, it is unclear from the submittal if all of these conditions have been met. The licensee should document their review of the plant safety analysis and the determination that only one of the two valves is credited in the safety analysis (that is, one valve could be removed without creating an unreviewed safety question or creating a conflict with regulatory or license requirements). The basis for the test acceptance criteria should also be documented. This documentation should be maintained on site for inspection by the staff.

13. In relief requests V-41, -42, and -46 (Units 1 and 2) the licensee proposes to disassemble and inspect the subject valves on a sampling basis at a refueling outage interval, but not necessarily during the refueling outage. These requests seek the option of performing the disassembly and inspection of the subject valves during power operations. There are several issues involved with this proposed test schedule:
    - The acceptability of the refueling interval frequency
    - Entering a TS LCO action statement to perform PM
    - Appropriate corrective actions if sample disassembly is done during power operations

    Disassembly of a check valve may render the associated safety system train inoperable, which could result in entry into a TS LCO action statement. NRC Inspection Manual, Part 9900: Technical Guidance, titled "Maintenance - Voluntary Entry into Limiting Conditions for Operation Action Statements to Perform Preventative Maintenance" provides guidance on performing PM when the maintenance requires rendering the affected system or equipment inoperable. The NRC considers check valve disassembly and inspection to be an intrusive maintenance procedure and not a test. Even though an LCO action statement can be entered to perform surveillance testing, an action statement should not be entered routinely to perform PM activities unless it is justified in accordance with the NRC Inspection

Manual, Part 9900. Therefore, if the proposed disassembly and inspection is to be performed during power operation and requires entry into an LCO action statement, the licensee should consider the following guidelines paraphrased from Part 9900:

a. There is a reasonable expectation that the on-line disassembly and inspection would improve safety by ensuring the operational readiness of the valves. The increase in reliability should exceed the effect of the increase in system unavailability.
b. The disassembly and inspection activity should be carefully planned to prevent repeatedly entering and exiting LCO action statements.
c. Other related equipment should not be removed from service during the performance of the on-line maintenance activity.
d. Maintenance should not be performed on-line unless confidence in the operability of the redundant subsystem is high. If equipment is degraded or trending towards a degraded condition in one train of a safety system, the redundant train should not be removed from service to perform on-line disassembly and inspections.
e. While performing an on-line maintenance activity, avoid performing other testing or maintenance that would increase the likelihood of a transient. There should be a reasonable expectation that the facility will continue to operate in a stable manner.

GL 89-04, Position 2, states "If the disassembled valve is not capable of being full-stroke exercised or there is binding or failure of valve internals, the remaining valves in that group must also be disassembled, inspected, and manually full-stroke exercised during the same outage." Until the operational readiness of the other group valves is verified by disassembly and inspection or by testing, their continued capability to perform their function should not be assumed. If a valve disassembled during power operation is found to be failed or excessively degraded, the licensee should immediately (before the end of the shift during which the failure is discovered) analyze the valve failure to determine the degradation mechanism and the likelihood that the other group valves are affected significantly by this mechanism. If the licensee's evaluation indicates that continued dependance on the operational readiness of these valves is not warranted, all group valves should be immediately declared inoperable and the appropriate TS required actions be followed. If the licensee determines that continued dependance on the operational readiness of these valves is warranted, the valves need not be immediately declared inoperable. However, all group valves should be disassembled and inspected or have their operational readiness verified by testing within the TS action statement time specified for one train of the safety system being inoperable. If the option of disassembly and inspection during power operations is be used, the licensee should document how the corrective action will be implemented for each specific valve group and the justification for performing this testing at a schedule different than the schedule approved by GL 89-04. The licensee's justification should consider the guidelines listed above as paraphrased from the NRC Inspection Manual, Part 9900. This documentation should be maintained on site for inspection by the staff.

14. Valves 1(2)-SI-88, 91, 94, 238, 239, and 240 (refer to relief request V-27 and TER Section 3.2.1.2) are in the safety injection lines to the RCS hot legs. There are two of these valves in series in each injection line (e.g., 1-SI-88 and -238). These valves

are ASME Code Class 1 and form the boundary with the connected ASME Code Class 2 piping. The systems that are connected to these injection headers are the chemical and volume control (CVCS) and low head safety injection (LHSI) systems. Portions of those systems are low pressure (i.e., the relief valves on the LHSI headers are set to open at 220 psig). The subject valves are not identified as PIVs in the plant TS or in the licensee's response to Generic Letter 87-06 (GL 87-06), dated June 12, 1987. The GL 87-06 response identifies motor operated valves (MOVs) 1-SI-MOV-1869A, -1869B, -1890A, and -1890B as PIVs in the hot leg injection headers. These MOVs provide one barrier between the RCS and the interconnected low pressure systems. The licensee's response to GL 87-06 does not identify a second barrier in the hot leg injection headers.

The licensee's letter dated June 12, 1987, lists valves 1(2)-SI-79, 82, 85, 241, 242, and 243 as PIVs that are tested in accordance with the plant TS. These valves are in the injection headers to the RCS cold legs in an arrangement that is similar to the hot leg injection header valves in relief request V-27. It appears that the hot leg injection header check valves (1[2]-SI-88, 91, 94, 238, 239, and 240) perform an Event V pressure isolation function similar to the cold leg injection header check valves. The licensee should evaluate the function of these valves to determine if they perform a pressure isolation function and have been erroneously omitted from the TS and the GL 87-06 response.

Attachment 2 of the licensee's response to GL 87-06, dated June 12, 1987, lists several valves as PIVs that are not categorized A or A/C in the IST program and that are not leak rate tested to assure their leak tight integrity. Only three of these valves (1-SI-109, -130, and -147) are exercised to the closed position by the IST program, the remainder are exercised and stroke timed (for the power-operated valves) to only the open position. OM-10, Paragraphs 4.2.1.2(a) and 4.3.2.2(a) require valves to be exercised to the position(s) required to fulfill their function(s). Since these valves perform a pressure isolation function in the closed position (as identified in the licensee's response to GL 87-06), they should also be exercised to the closed position and the power-operated valves stroke timed to the closed position. The licensee should make the changes to the testing of these valves necessary to comply with the Code requirements or submit requests for relief where compliance is impractical or constitutes a hardship without a compensating increase in the level of quality and safety. In addition, the licensee should document their determination that the activities performed in lieu of leak rate testing these valves adequately assures the integrity of an independent barrier at the reactor coolant pressure boundary.