Idaho
National
Engineering
Laboratory

Managed
by the U.S.
Department
of Energy

EGG-NTA-7078
October 1988
Revision 1

TECHNICAL EVALUATION REPORT

PUMP AND VALVE INSERVICE TESTING PROGRAM
WATERFORD STEAM ELECTRIC STATION, UNIT 3
Docket Number 50-382

C. B. Ransom
H. C. Rockhold
T. L. Cook
W. C. Hemming

EG&G Idaho

Prepared for the
U.S. NUCLEAR REGULATORY COMMISSION

Work performed under
DOE Contract
No. DE-AC07-76ID01570

EGG-NTA-7078
Revision 1

TECHNICAL EVALUATION REPORT
PUMP AND VALVE INSERVICE TESTING PROGRAM
WATERFORD STEAM ELECTRIC STATION, UNIT 3

C. B. Ransom
H. C. Rockhold
T. L. Cook
W. C. Hemming

Published October 1988

EG&G Idaho, Inc.
Idaho Falls, Idaho 83415

Prepared for the
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555
Under DOE Contract No. DE-AC07-76ID01570
FIN No. A6812

ABSTRACT

This EG&G Idaho, Inc., report presents the results of our evaluation of the Waterford Steam Electric Station, Unit 3, Inservice Testing Program for pumps and valves whose function is safety related.

FOREWORD

This report is supplied as part of the "Review of Pump and Valve Inservice Testing Programs for Operating Plants" program being conducted for the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Mechanical Engineering Branch, by EG&G Idaho, Inc., Regulatory And Technical Assistance.

The U.S. Nuclear Regulatory Commission funded the work under the authorization B&R 20-19-05-02, FIN No. A6812.

Docket No. 50-382

CONTENTS

SAFETY EVALUATION REPORT

PUMP AND VALVE INSERVICE TESTING PROGRAM

WATERFORD STEAM ELECTRIC STATION, UNIT 3

1. INTRODUCTION

Contained herein is a safety evaluation of the pump and valve inservice testing (IST) program submitted by Louisiana Power and Light Company (LP&L) for the Waterford Steam Electric Station, Unit 3.

The working meeting with LP&L representatives, was conducted on October 24 and 25, 1984. The licensee's IST program dated July 8, 1985 and revision 4 and 5 dated April 4, 1988, were reviewed to verify compliance of proposed tests of pumps and valves whose function is safety related with the requirements of the ASME Boiler and Pressure Vessel Code (the Code), Section XI, 1980 edition through winter 1981 addenda. In their IST program, LP&L has requested relief from the Code testing requirements for specific pumps and valves, and these requests have been evaluated individually to determine whether they have significant risk implications and whether the tests, as required, are indeed impractical. Any IST program revisions subsequent to those noted above are not addressed in this SER. Required program changes, such as additional relief requests or the deletion of any components from the IST program, should be submitted to the NRC under separate cover in order to receive prompt attention, but should not be implemented prior to review and approval by the NRC.

The conclusions in this SER of the Waterford Steam Electric Station, Unit 3 pump and valve inservice testing program and the associated relief requests are those of the NRC staff. These findings apply only to component testing (i.e., pumps and valves), and are not intended to provide the basis to change the licensee's current technical specifications system test requirements, such as those for the Auxiliary Feedwater System.

A summary of Section XI pump and valve testing requirements is provided in Appendix A.

Category A, B, and C valves that meet the requirements of the ASME Code, Section XI, and are not exercised quarterly are listed in Appendix B.

A listing of the P&IDs used during this review is contained in Appendix C.

IST program anomalies that were found during the review are identified in Appendix D.

2. PUMP TESTING PROGRAM

The Waterford Steam Electric Station, Unit 3, IST program submitted by Louisiana Power and Light Company (LP&L) was examined to verify that all pumps whose function is safety related are included in the IST program and are subjected to the periodic tests required by the ASME Code, Section XI. The staff's review found that these pumps are tested in accordance with Section XI except for those pumps identified below. Each LP&L basis for requesting relief from the pump testing requirements and the staff's evaluation of that request is summarized below.

2.1 General Relief Requests

2.1.1 Recirculation Loop Testing Of Pumps

2.1.1.1 Relief Request. The licensee has requested relief from IWP-3100 requiring the resistance of a system to be varied until the reference flow or pump differential pressure are at the reference value. The licensee has proposed to test the pumps using a fixed resistance recirculation flow path and measure pump differential pressure in order to determine pump degradation for the Containment Spray, High Pressure Safety Injection, Low Pressure Safety Injection, Emergency Feedwater and Boric Acid systems.

2.1.1.1.1 Code Requirements--IWP-3100 states that "The resistance of the system shall be varied until either the measured differential pressure or measured flowrate equals the corresponding reference value."

2.1.1.1.2 Licensee's Basis For Relief--These systems have recirculation flow paths that contain either a restricting orifice or, in the case of the Boric Acid Pumps, a fully-open globe valve. The pumps that have a restricting orifice are as follows: Containment Spray, High Pressure Safety Injection, Low Pressure Safety Injection, and Emergency Feedwater. The orifice limits flow through the recirculation line to a specific amount. The flow rate is therefore fixed and cannot be adjusted. The Boric Acid Pumps do not have a restricting orifice but do have a throttled and

locked needle valve in parallel with a globe valve which can be positioned only to the fully-opened or fully-closed position. The recirculation flow is therefore fixed. When these pumps are tested using the fixed resistance flow paths, the flowrates will be approximately the same each time the tests are conducted.

2.1.1.1.3 Evaluation--The licensee has demonstrated that the recirculation flow paths to be used during the IST testing are of a fixed resistance. A fixed resistance flow path creates a test that is repeatable and can be used with reference values that are based on this recirculation loop. However, the staff does not agree with the licensee's alternative to use only pump differential pressure to measure pump operability.
For the Containment Spray, High Pressure Safety Injection, and Low Pressure Safety Injection systems, the recirculation lines have installed flow instrumentation; therefore, relief to measure only pump differential pressure cannot be granted. The licensee must measure and record all of the parameters in Table IWP-3100-2 in order to determine pump operability.
In the case of the Boric Acid and Emergency Feedwater systems, the recirculation lines are not instrumented for flow. For these pumps, relief from measuring the flow during the quarterly test using the recirculation line can only be granted if the licensee commits to testing each pump in these systems at the earliest possible time when plant conditions allow measuring all of the parameters in Table IWP-3100-2, i.e. cold shutdown or refueling.

2.1.1.1.4 Conclusion--The staff concludes that, if the licensee commits to the stipulations in 2.1.3.3, using fixed resistance recirculation flowpaths in conjunction with reduced frequency full flow testing in the required systems, will give reasonable assurance of pump operability required by the Code and that the relief, thus granted, will not endanger life or property or the common defense and security of the public.

2.2 Chemical and Volume Control System

2.2.1 Measurement Of Pump Inlet Pressure.

2.2.1.1 Relief Request. The licensee has requested relief from the Code requirements to measure pump inlet pressure before pump startup and during the inservice test for the charging pumps.

2.2.1.1.1 Code Requirements--Refer to Appendix A.

2.2.1.1.2 Licensee's Basis for Requesting Relief--The Charging Pumps are positive displacement type pumps and do not have a performance curve like centrifugal pumps. Variations in inlet and differential pressure do not affect pump flow as long as the Net Positive Suction Head (NPSH) requirements of the pumps are fulfilled. Each pump inlet has a pressure switch which will not allow the pump to start if NPSH requirements are not met; therefore, inlet pressure of the Charging Pumps will not be measured. Since inlet pressure is not measured, differential pressure cannot be measured. As an alternate test, discharge pressure will be used for determining pump operability. If the discharge pressure is greater than or equal to RCS pressure, and measured flow is greater than or equal to 0.90 times the reference flow, the pumps are operable.

2.2.1.1.3 Evaluation--The staff agrees with the licensee's basis and, therefore, relief should be granted from the Code requirements to measure charging pump inlet pressure before pump startup and during the inservice test. Additionally, since pump inlet pressure is not measured, pump differential pressure will not be measured or calculated. Since the charging pumps are positive displacement pumps, variations in these parameters are not indicative of pump degradation and would not contribute to an evaluation of the hydraulic condition of these pumps.

2.2.1.1.4 Conclusion--The staff concludes that the proposed alternate testing should provide sufficient information for evaluation of the condition of the charging pumps and will give reasonable assurance of pump operability required by the Code and that the relief, thus granted, will not endanger life or property or the common defense and security of the public.

2.2.2 Instrumentation Range.

2.2.2.1 Relief Request. The licensee has requested relief from the instrumentation full-scale range requirements of IWP-4120 and has proposed to utilize the instrumentation currently installed in the piping downstream of the charging pumps for measurement of charging pump flow-rate during the inservice testing.

2.2.2.1.1 Code Requirements--IWP-4120 states, "the full-scale range of each instrument shall be three times the reference value or less."

2.2.2.1.2 Licensee's Basis for Requesting Relief--The Charging Pumps' discharge flow indicator does not comply with this requirement. Each of the three pumps produces a flow of 44 gpm. The flow gauge has a full-scale range of 150 gpm in order to accommodate three-pump flow, such as during safety injection operations. The full-scale range is 3.4 times the reference value. The small difference between the code requirement and the range of this flow gauge is minor.

As an alternate, the existing, installed flow indicator will be used for quarterly pump operability testing. The accuracy of the installed flow indicator is within Section XI requirements.

2.2.2.1.3 Evaluation--The staff agrees with the licensee's basis and, therefore, relief should be granted from the IWP-3120 requirement for the charging pump flow instrument. The licensee has demonstrated that the installed flow gauge has a maximum range 3.4 times the reference value for one pump in order to provide indication of the combined flow of all three charging pumps. The installed flow indicators full-scale range is only marginally greater than the Code requirement, and the accuracy of the indicator is within the Section XI requirements.

2.2.2.1.4 Conclusion. The staff concludes that the proposed alternate testing should provide sufficient information for evaluation of the condition of the charging pumps and will give reasonable assurance of pump operability required by the Code and that the relief, thus granted, will not endanger life or property or the common defense and security of the public.

3. VALVE TESTING PROGRAM

The Waterford, Unit 3 IST program submitted by Louisiana Power and Light Company was examined to verify that valves whose function is safety related are included in the program and are subjected to the periodic tests required by the ASME Code, Section XI, and the NRC positions and guidelines. The staff's review found that, except as noted in Appendix D or where specific relief from testing has been requested, these valves are tested to the Code requirements and the NRC positions and guidelines. Each Louisiana Power and Light Company basis for requesting relief from the valve testing requirements and the staff's evaluation of that request is summarized below and grouped according to system and valve category.

3.1 General Relief Requests

3.1.1 Stroke Time Measurements for Rapid Acting Valves

3.1.1.1 Relief Request. The licensee has requested relief from the Section XI stroke time trending and corrective action requirements for solenoid actuated valves that have stroke time limits of 2 seconds or less, and proposed to perform corrective action on these valves only when the stroke time limits are exceeded.

3.1.1.1.1 Code Requirement--IWV-3417(a) requires that for valves with full-stroke times of 10 seconds or less, if the measured stroke time increases by 50% or more from the previous test, the test frequency shall be increased to once each month until corrective action is taken.

3.1.1.1.2 Licensee's Basis for Requesting Relief--These solenoid-actuated valves have extremely short stroke times. Accurate measurement of these stroke times is not practical. In addition, the stroke times may vary from one test to another due to temperature and/or pressure variations. The stroke times for these valves will be measured to the nearest second and compared to the stroke time limit. Acceptance of the test will be based only on the stroke time limit and not on the "50%" criteria in IWV-3417.

3.1.1.1.3 Evaluation--The staff agrees with the licensee's basis and, therefore, relief should be granted from the Section XI requirements for solenoid valves whose stroke time limit is 2 seconds or less. The licensee has shown that it is not practical to obtain accurate measurements of the stroke times for these rapid acting solenoid valves. There are many factors, including the response time of the individual performing the testing, that could produce substantial variations in valve stroke times from one test to the next. Therefore, the 50% increase criterion is not practical for valves with stroke time limits of 2 seconds or less. However, the staff requires a clarification to be included into the corrective action associated with the alternate testing; that is, if when tested, any valve exceeds the 2 second maximum stroke time, the valve will be declared inoperable until corrective action is taken. Also note that if the maximum stroke time assigned to any valve listed in this relief is increased to greater than 2 seconds, the Code requirements as depicted by paragraph IWV-3417 will then apply to that valve.

3.1.1.1.4 Conclusion--Based on the considerations discussed above, the staff concludes that, with the stipulated clarification added, the proposed alternate testing will give reasonable assurance of valve operability as required by the Code and that the relief, thus granted, will not endanger life or property or the common defense and security of the public.

3.1.2 Cold Shutdown Testing of Valves

3.1.2.1 Relief Request. The licensee has requested relief from the corrective action requirements of Section XI for valves that are tested on a cold shutdown frequency and proposed to retest these valves as necessary to meet the plant operability requirements as defined in the plant Technical Specifications.

3.1.2.1.1 Code Requirement--When corrective action is required as a result of tests made during cold shutdown, the condition shall be corrected before startup. A retest showing acceptable operation shall be run following any required corrective action before the valve is returned to service.

3.1.2.1.2 Licensee's Basis for Requesting Relief--The plant Technical Specifications provide the requirements and plant conditions necessary for plant startup, i.e., mode changes. The test requirement will be satisfied before the valve is required for plant operability as defined in the plant Technical Specifications.

3.1.2.1.3 Evaluation--The staff agrees with the licensee's basis and, therefore, relief should be granted from the retesting requirements of Section XI, IWV-3417(b). The plant Technical Specifications identify the equipment that is required to be operable for plant startup and operation. The licensee has indicated that the post-corrective-action retest of valves will be performed prior to the time that they are required to meet the operability requirements of the plant Technical Specifications.

3.1.2.1.4 Conclusion--Based on the considerations discussed above, the staff concludes that the proposed alternate testing will give reasonable assurance of valve operability as required by the Code and that the relief, thus granted, will not endanger life or property or the common defense and security of the public.

3.1.2.2 Relief Request. The licensee has requested relief from the Section XI stroke time corrective action requirement to increase the testing frequency for all power operated valves that are normally tested during cold shutdowns and proposed to increase the valve testing frequency to once each cold shutdown, not to exceed once each month for frequent cold shutdowns or extended shutdowns.

3.1.2.2.1 Code Requirement--IWV-3417(a) requires the test frequency to be increased to once each month until corrective action is taken for valves whose measured stroke times exceed the previous stroke times by 25% or more, for valves with stroke times greater than 10 seconds, or 50% or more, for valves with stroke times less than or equal to 10 seconds.

3.1.2.2.2 Licensee's Basis for Requesting Relief--Valves that are normally tested during cold shutdown cannot be tested once each month. Stroking these valves during power operation may place the plant in an unsafe condition. The test frequency shall be increased to once each cold shutdown, not to exceed once each month.

3.1.2.2.3 Evaluation--The Code permits a licensee to defer valve testing from quarterly to cold shutdowns if it is impractical to perform during power operations (refer to IWV-3412(a) and IWV-3522). If, during the performance of cold shutdown testing, a power operated valve fails to exhibit the required change of position within the stroke time limits expressed in IWV-3417(a), the Code requires the licensee to increase the frequency of testing to once a month until corrective action is taken. These valves are not considered inoperable but only in an alert range requiring an increased frequency of testing. Since these valves are not inoperable, plant startup is still permitted by technical specifications. However, these valves have been previously identified for testing only at cold shutdowns and the testing cannot be performed during power operations. By indicating during testing they have degraded beyond the limits allowed by the Code, it is non-conservative to defer testing to a frequency greater than monthly.
Safety related power operated valves that cannot be tested during power operations which require an increase in testing frequency as a result of testing performed during cold shutdowns, in accordance with IWV-3417(a), must have corrective action taken as specified in IWV-3417(b) prior to returning to power operation or the plant must be returned to a mode that permits testing the valves, on a monthly basis, as required.

Conclusion--Based on the considerations discussed above, the staff concludes that the proposed alternate testing does not provide a reasonable alternative to the Code requirements and relief as requested should not be granted.

3.1.2.3 Relief Request. The licensee has requested relief from the Section XI stroke time requirements for solenoid actuated valves that have limiting values of full-stroke times of 2 seconds or less and proposed to perform corrective action on these valves only when the stroke time limits are exceeded.

3.1.2.3.1 Code Requirement--IWV-3417 requires that for valves with full-stroke times of 10 seconds or less, if the measured stroke time increases by 50% or more from the previous test, the test frequency shall be increased to once each month until corrective action is taken.

3.1.2.3.2 Licensee's Basis for Requesting Relief--These solenoid-actuated valves have extremely short stroke times. Accurate measurement of these stroke times is not practical. In addition, the stroke times may vary from one test to another due to temperature and/or pressure variations. These valves will be full-stroke exercised either during cold shutdown or during normal plant cooldown approaching cold shutdown. The stroke times will be measured to the nearest second and compared to the stroke time limit. Acceptance of the test will be based only on the stroke time limit and not on the "50%" criteria in IWV-3417.

3.1.2.3.3 Evaluation--The staff agrees with the licensee's basis and, therefore, relief should be granted from the Section XI requirements for solenoid valves whose stroke time limit is 2 seconds or less. The licensee has shown that it is not practical to obtain accurate measurements of the stroke times for these rapid acting solenoid valves. There are many factors, including the response time of the individual performing the testing, that could produce substantial variations in valve stroke times from one test to the next. Therefore, the 50% increase criterion is not practical for valves with stroke time limits of 2 seconds or less. However, the staff requires a clarification to be included into the corrective action associated with the alternate testing; that is, if when tested, any valve exceeds the 2 second maximum time, the valve will be declared inoperable until corrective action is taken. Also note, if the maximum stroke time for any valve associated with this relief is increased to greater than 2 seconds, that valve will no longer be covered by this relief.

3.1.2.3.4 Conclusion--Based on the considerations discussed above, the staff concludes that the proposed alternate testing will give reasonable assurance of valve operability and that the relief, thus granted, will not endanger life or property or the common defense and security of the public.

3.1.3 Leak-Rate Exercising of Valves

3.1.3.1 Relief Request. The licensee has requested relief for the following valves from the requirements of Section XI, paragraph IWV-3521, which requires check valves to be full-stroke exercised every 3 months. The licensee has proposed to leak-rate test these valves during each refueling outage, as an alternative to the exercising requirements of the Code.

Valve	Description
SA-909	Cont. station air supply isolation.
CMU-245	Condensate supply to cont.
PMU-152	Primary makeup to cont.
NG-158	Nitrogen supply to cont.
FP-602	Fire protection water to cont.

3.1.3.1.1 Code Requirement--IWV-3521 requires all active check valves to be full-stroke exercised at least once every 3 months.

3.1.3.1.2 Licensee's Basis For Requesting Relief--The operability testing (full or partial stroke) during power operation or cold shutdown of these valves provides no assurance of an increase in safety. The valves are containment isolation valves which are normally closed and passive.

3.1.3.1.3 Evaluation--Valves that do not change position during plant operation and do not change position when performing their safety function are considered passive and relief from exercising is not required. If any of these valves are periodically opened during plant operation, they are not considered passive. However, the only practical method of verifying valve closure is by leak rate testing performed at refueling. Therefore, for these valves that do open during plant operation, the staff agrees with the licensee's basis and, therefore, relief should be granted from the Section XI requirements.

3.1.3.1.4 Conclusion--Based on the considerations above, the staff concludes that the proposed alternate testing will give reasonable assurance of valve operability and that the relief, thus granted, will not endanger the life or property or the common defense and security of the public.

3.2 Reactor Coolant System

3.2.1 Category B Valves

3.2.1.1 Relief Request. The licensee has requested relief from the exercising requirements of Section XI for the following valves and proposed to full-stroke exercise them during each cold shutdown, if the reactor coolant system is depressurized, or at cold shutdown or refueling outage at least once per 18 months per plant Technical Specification 4.4.10.

Valve	Description
RC-1014	Reactor pressure vessel head vent valve
RC-1015	Reactor pressure vessel head vent valve
RC-1017	Reactor and pressurizer vent to quench tank isolation valve
RC-3183	Pressurizer head vent valve
RC-3184	Pressurizer head vent valve
RC-3186	Reactor and pressurizer vent to quench tank isolation valve

3.2.1.1.1 Code Requirement--Refer to Appendix A.

3.2.1.1.2 Licensee's Basis for Requesting Relief--Operability testing (full-stroke) of these normally-closed valves during power operation would cause a loss of reactor coolant which would produce unwanted pressure and level changes in the reactor coolant system. These pilot-operated solenoid valves, which are installed with RCS pressure under the pilot disc, have historically had a "burping" problem at other nuclear plants. With the RCS pressurized, opening either valve produces a pressure surge in the line which causes the other valve to pop open, thereby opening a line from the RCS to the quench tank. The valves can generally be closed after flow stabilizes in the vent line.

Operability testing (full-stroke) during cold shutdown with the RCS pressurized produces the same effects as testing at power except that the amount of water lost would be less. Plant Technical Specification 4.4.10, which is based on NUREG-0737 and Generic Letter No. 83-37, requires that these valves be stroked and flow should be verified at least once per 18 months during cold shutdown or refueling. Testing these valves more frequently, such as during each cold shutdown with the RCS pressurized,

produces some undesirable effects. For example, the water and gases vented from the RCS to the quench tank are contaminated with radioactive material. Routinely venting the RCS would cause an increase in radiation and contamination levels inside containment, particularly if the quench tank rupture disc pressure is exceeded. In addition, due to valve design, routinely opening these valves greatly increases the probability of them sticking open, which will overfill the quench tank and dump contaminated water on the containment floor. However, these valves can be safely exercised during cold shutdown if the RCS is depressurized. Valve design does not facilitate partial-stroke testing.

3.2.1.1.3 Evaluation--The staff agrees with the licensee's basis and, therefore, relief should be granted from the exercising requirements of Section XI for the reactor and pressurizer head vent valves. The licensee has demonstrated that these valves cannot be exercised during power operations without a significant risk of venting coolant from the RCS to the quench tank with a resultant decrease in RCS pressure and pressurizer level. There is also an increased probability of releasing radioactive coolant to the containment if sufficient coolant is vented from the RCS to the quench tank to raise the quench tank pressure above the rupture disc pressure.

3.2.1.1.4 Conclusion--Based on the considerations discussed above, the staff concludes that the proposed alternate testing will give reasonable assurance of valve operability as required by the Code and that the relief, thus granted, will not endanger life or property or the common defense and security of the public.

3.3 Safety Injection System

3.3.1 Category AC Valves

3.3.1.1 Relief Request. The licensee has requested relief from the exercising requirements of Section XI for SI-329A, 329B, 330A, and 330B, the safety injection tank discharge check valves, and proposed to disassemble and manually exercise one valve from each of the following groups during each refueling outage on a staggered sampling basis.

Group 1	Group 2
SI-329A	SI-330A
SI-329B	
SI-330B	

3.3.1.1.1 Code Requirement--Refer to Appendix A.

3.3.1.1.2 Licensee's Basis for Requesting Relief--The operability testing of these normally closed check valves per IWV-3520 during normal operation or cold shutdown is not practical. During normal operation, these valves cannot be full-stroke exercised because the safety injection tanks (SITs) cannot overcome RCS pressure. The valves cannot be partial-stroke exercised during normal operation without making the SITs inoperable, thus placing the plant in an unsafe condition. During cold shutdown, these valves cannot be fully or partially stroked without overpressurizing the RCS. During refueling outages, these valves cannot be full-stroke exercised at SIT operating pressure without possibly causing internal core damage due to excessive flow rates.

3.3.1.1.3 Evaluation--The staff agrees with the licensee's basis and, therefore, relief should be granted from the exercising requirements of Section XI for the safety injection tank discharge check valves. The licensee has demonstrated that the safety injection tank pressure is less than normal operating RCS pressure, which prevents exercising these valves with flow during power operations. Initiating flow through these valves during cold shutdowns could result in low-temperature overpressurization of the RCS. Establishing full design safety injection tank flow into the RCS during refueling outages could cause internal core damage, which makes valve disassembly the only practical method of full-stroke exercising these valves given the existing system design. The licensee's proposed staggered sampling basis is acceptable; however, it is the staff position that, if during a disassembly inspection of a valve, it is found that the valve's full-stroke capability is in question, the remainder of the valves in that group must also be disassembled, inspected, and manually full-stroke exercised during the same outage.

3.3.1.1.4 Conclusion--Based on the considerations discussed above, the staff concludes that the proposed alternate testing will give reasonable assurance of valve operability as required by the Code and that the relief, thus granted, will not endanger life or property or the common defense and security of the public.

3.3.1.2 Relief Request. The licensee has requested relief from the exercising requirements of Section XI for SI-335A, 335B, 336A, and 336B, the combined safety injection header check valves, and proposed to partial-stroke exercise these valves during each cold shutdown using normal shutdown cooling flow and to disassemble and manually exercise one valve from the group during each refueling outage on a staggered sampling basis.

3.3.1.2.1 Code Requirement--Refer to Appendix A.

3.3.1.2.2 Licensee's Basis for Requesting Relief--The operability testing (full or partial-stroke) of these normally closed check valves per IWV-3520 during normal operation is not practical. During normal operation, these valves cannot be full-stroke exercised because neither the LPSI pumps, HPSI pumps nor safety injection tanks (SITs) can overcome RCS pressure. Partial-stroking these valves during power operation using charging flow would induce unwanted thermal shock to safety injection nozzles and piping. During cold shutdown, these valves cannot be full-stroke tested unless all LOCA test conditions can be met. Fulfilling LOCA test conditions would require removing the Reactor Pressure Vessel (RPV) head. However, these valves are partial-stroke tested during each cold shutdown using normal shutdown cooling flow.

3.3.1.2.3 Evaluation--The staff agrees with the licensee's basis and, therefore, relief should be granted from the exercising requirements of Section XI for check valves SI-335A, 335B, 336A, and 336B. The licensee has demonstrated that normal operating RCS pressure is greater than the safety injection tank pressure or the maximum discharge pressure developed by the LPSI pumps or the HPSI pumps; therefore, these valves cannot be full-stroke exercised during power operation. A partial-stroke exercise utilizing charging flow is undesirable during power operations since it would result in thermal shock to the safety injection piping and nozzles. Design

accident flow cannot be established through these valves during cold shutdowns, since this could result in low-temperature overpressurization of the RCS. Establishing design accident flow through these valves during refueling outages could cause internal core damage, which makes valve disassembly the only practical method of full-stroke exercising these valves given the existing system design (refer to Section 3.4.1.1.3).

3.3.1.2.4 Conclusion--Based on the considerations discussed above, the staff concludes that the proposed alternate testing will give reasonable assurance of valve operability as required by the Code and that the relief, thus granted, will not endanger life or property or the common defense and security of the public.

3.3.1.3 Relief Request. The licensee has requested relief from the exercising requirements of Section XI for SI-512A and B, HPSI discharge to the RCS hot leg check valves, and proposed to full-stroke exercise these valves during each refueling outage.

3.3.1.3.1 Code Requirement--Refer to Appendix A.

3.3.1.3.2 Licensee's Basis for Requesting Relief--The operability testing (full or partial-stroke) of these normally closed check valves per IWV-3520 during power operation is not practical. Exercising these valves requires flow verification into the RCS. During power operation the HPSI pumps cannot overcome RCS pressure and, therefore, cannot deliver any flow. Partial-stroking these valves during power operation using charging flow would induce unwanted thermal shock to safety injection nozzles and piping. During cold shutdown, these valves cannot be full-stroke exercised because design flow cannot be verified through the valves unless all LOCA test conditions can be met (i.e., suction from the RWSP through two pumps to the RCS with the RCS at atmospheric pressure). Also, during cold shutdown, these valves cannot be partial-stroke exercised because such testing would induce unwanted thermal shock to the safety injection nozzles and piping. Partial-stroke exercising at cold shutdowns also increases the possibility of overproducing the RCS at low temperature.

3.3.1.3.3 Evaluation--The staff agrees with the licensee's basis and, therefore, relief should be granted from the exercising requirements of Section XI for check valves SI-512A and B. The licensee has shown that full flow through these valves can only be established when the HPSI pumps are injecting into the RCS. During power operation the HPSI pumps do not develop sufficient head to overcome RCS pressure. The charging pumps have sufficient head to pump into the RCS through these valves, however, partial-stroke exercising these valves with the charging pumps could thermal shock the safety injection piping and nozzles, which could result in premature failure of these components. The licensee also showed that these valves cannot be full- or partial-stroke exercised during cold shutdowns because it could result in low-temperature overpressurization of the RCS.

3.3.1.3.4 Conclusion--Based on the considerations discussed above, the staff concludes that the proposed alternate testing will give reasonable assurance of valve operability as required by the Code and that the relief, thus granted, will not endanger life or property or the common defense and security of the public.

3.3.1.4 Relief Request. The licensee has requested relief from the exercising requirements of Section XI for SI-142A, 142B, 143A, and 143B, the LPSI to the RCS cold legs check valves, and proposed to partial-stroke exercise these valves during cold shutdowns and full-stroke exercise them during refueling outages.

3.3.1.4.1 Code Requirement--Refer to Appendix A.

3.3.1.4.2 Licensee's Basis for Requesting Relief--The operability testing (full-stroke) of these normally closed check valves per IWV-3520 requires flow verification under LPSI into the RCS. These valves cannot be full-stroke exercised during power operation because the LPSI pumps cannot overcome RCS pressure. Partial-stroking these valves, using flow into containment then back to the RWSP through a drain valve, would defeat the safety function of RCS pressure isolation valves. During cold shutdown, these valves cannot be full-stroke exercised because design flow cannot be verified through the valves unless all LOCA test conditions can be met (i.e., suction from the RWSP through both pumps to the RCS with the RCS at atmospheric pressure).

3.3.1.4.3 Evaluation--The staff agrees with the licensee's basis and, therefore, relief should be granted from the exercising requirements of Section XI for the LPSI to RCS cold legs check valves. These valves cannot be full-stroke exercised quarterly during power operation since the only full flow path is into the RCS, and the LPSI pumps do not develop sufficient head to overcome RCS operating pressure. These valves cannot be partial-stroke exercised during power operation since the LPSI pumps do not develop sufficient head to overcome safety injection tank pressure and the safety injection tanks cannot be isolated during power operation. A full-stroke exercise cannot be verified during cold shutdowns since the RCS pressure would be above atmospheric pressure.

3.3.1.4.4 Conclusion--Based on the considerations discussed above, the staff concludes that the proposed alternate testing will give reasonable assurance of valve operability as required by the Code and that the relief, thus granted, will not endanger life or property or the common defense and security of the public.

3.3.1.5 Relief Request. The licensee has requested relief from the exercising requirements of Section XI for the following valves and proposed to full-stroke exercise these valves during each refueling outage.

Valve	Description
SI-241	HPSI header to RCS cold leg check valve
SI-242	HPSI header to RCS cold leg check valve
SI-243	HPSI header to RCS cold leg check valve
SI-244	HPSI header to RCS cold leg check valve
SI-510A	HPSI header to RCS hot leg check valve
SI-510B	HPSI header to RCS hot leg check valve

3.3.1.5.1 Code Requirement--Refer to Appendix A.

3.3.1.5.2 Licensee's Basis for Requesting Relief--The operability testing (full-stroke) of these normally-closed check valves per IWV-3520 requires flow verification into the RCS. These valves cannot be full-stroke exercised during power operation because the HPSI pumps cannot overcome RCS pressure. During power operation, partial stroking these valves, using HPSI flow into containment then back to the RWSP through a drain valve, would

defeat the safety function of RCS pressure isolation valves (PIVs). During cold shutdown, these valves cannot be full-stroke exercised because design flow cannot be verified through the valves unless all LOCA test conditions can be met (i.e., suction from the RWSP through two HPSI pumps to the RCS with the RCS at atmospheric pressure). Also, during cold shutdown, these valves cannot be partial-stroke exercised because such testing would induce unwanted thermal shock to the safety injection nozzles and piping. Partial-stroke exercising at cold shutdowns also increases the possibility of overproducing the RCS at low temperature.

3.3.1.5.3 Evaluation--The staff agrees with the licensee's basis and, therefore, relief should be granted from the exercising requirements of Section XI for these HPSI header to the RCS check valves. These valves cannot be full-stroke exercised quarterly during power operations, since the only full flow path is into the RCS and the HPSI pumps do not develop sufficient head to overcome RCS operating pressure. These valves cannot be exercised during cold shutdowns because it could result in a low-temperature overpressurization of the RCS. These valves should not be partial-stroke exercised during power operation since this would defeat the pressure boundary isolation function of these valves.

3.3.1.5.4 Conclusion--Based on the considerations discussed above, the staff concludes that the proposed alternate testing will give reasonable assurance of valve operability as required by the Code and that the relief, thus granted, will not endanger life or property or the common defense and security of the public.

3.3.2 Category C Valves

3.3.2.1 Relief Request. The licensee has requested relief from the exercising requirements of Section XI for the following valves and proposed to partial-stroke exercise these valves quarterly, in conjunction with the pump testing, and full-stroke exercise the valves during refueling outages.

Valves	Description
SI-107A and B	LPSI AND HPSI suction from the RWSP check valves
SI-1071A and B	LPSI pumps suction check valves
SI-108A and B	LPSI pumps suction check valves
SI-201A and B	HPSI pumps suction check valves

3.3.2.1.1 Code Requirement--Refer to Appendix A.

3.3.2.1.2 Licensee's Basis for Requesting Relief--The operability testing (full-stroke) of these normally closed check valves per IWV-3520 requires flow verification into the RCS. These valves cannot be full-stroke exercised during power operation because the pumps cannot overcome RCS pressure. During cold shutdown, these valves cannot be full-stroke exercised because design flow cannot be verified through the valves unless all LOCA test conditions can be met (i.e., suction from the RWSP through the pumps to the RCS with the RCS at atmospheric pressure).

3.3.2.1.3 Evaluation--The staff agrees with the licensee's basis and, therefore, relief should be granted from the exercising requirements of Section XI for the LPSI and HPSI pump suction check valves. These valves cannot be full-stroke exercised quarterly during power operation, since the only full flow path is into the RCS and the pumps do not develop sufficient head to overcome RCS operating pressure. A full-stroke exercise cannot be verified during cold shutdowns, since RCS pressure would be above atmospheric pressure. During cold shutdowns a full-stroke exercise of these valves could also result in low-temperature overpressurization of the RCS.

3.3.2.1.4 Conclusion--Based on the considerations discussed above, the staff concludes that the proposed alternate testing will give reasonable assurance of valve operability as required by the Code and that the relief, thus granted, will not endanger life or property or the common defense and security of the public.

3.3.2.2 Relief Request. The licensee has requested relief from the exercising requirements of Section XI for SI-207A, 207B, 207A/B, and 216, the HPSI pumps discharge check valves, and proposed to full-stroke exercise these valves during each refueling outage.

3.3.2.2.1 Code Requirement--Refer to Appendix A.

3.3.2.2.2 Licensee's Basis for Requesting Relief--The operability testing (full-stroke) of these normally closed check valves per IWV-3520 requires flow verification into the RCS. These valves cannot be full-stroke exercised during power operation because the HPSI pumps cannot overcome RCS pressure. During power operation, partial stroking these valves, using HPSI flow into containment then back to the RWSP through a drain valve, would defeat the safety function of RCS pressure isolation valves (PIVs). During cold shutdown, these valves cannot be full-stroke exercised because design flow cannot be verified through the valves unless all LOCA test conditions can be met (i.e., suction from the RWSP through two HPSI pumps to the RCS with the RCS at atmospheric pressure). Also, during cold shutdown, these valves cannot be partial-stroke exercised because such testing would induce unwanted thermal shock to the safety injection nozzles and piping. Partial-stroke exercising at cold shutdowns also increases the possibility of overpressurizing the RCS at low temperature.

3.3.2.2.3 Evaluation--The staff agrees with the licensee's basis and, therefore, relief should be granted from the exercising requirements of Section XI for SI-207A, 207B, 207A/B, and 216. These valves cannot be full-stroke exercised quarterly during power operations, since the only full flow path is into the RCS and the HPSI pumps do not develop sufficient head to overcome RCS operating pressure. These valves cannot be full or partial-stroke exercised during cold shutdowns because pumping RWSP water into the RCS could result in a low-temperature overpressurization of the RCS. Partial-stroke exercising these valves quarterly would require pumping water through system pressure boundary isolation valves which would defeat the safety function of the isolation valves.

3.3.2.2.4 Conclusion--Based on the considerations discussed above, the staff concludes that the proposed alternate testing will give reasonable assurance of valve operability as required by the Code and that the relief thus granted will not endanger life or property or the common defense and security of the public.

3.3.2.3 Relief Request. The licensee has requested relief from the exercising requirements of Section XI for SI-604A and B, the safety injection system sump outlet check valves, and proposed to disassemble one of the check valves and manually exercise it each refueling outage on a staggered sampling basis.

3.3.2.3.1 Code Requirement--Refer to Appendix A.

3.3.2.3.2 Licensee's Basis for Requesting Relief--The operability testing (full-stroke) of these normally closed check valves per IWV-3520 during power operation is not practical. Full-stroke exercising requires flow verification from the SIS sump through a HPSI pump into the RCS with the RCS at atmospheric conditions. During power operation and cold shutdowns, these test conditions cannot be met. During any mode of operation (including power operation, cold shutdown, and refueling outages), the pumping of unknown-quality water into the RCS defeats the purpose of primary water chemistry controls and could cause violation of plant Technical Specifications. The only possible means of providing flow through these valves is through the check valve test connection. However, flow through the 3/4-inch test line only verifies a partial-stroke test. The small amount of water that could be pumped through the test connection would not prove operability nor increase plant safety.

3.3.2.3.3 Evaluation--The staff agrees with the licensee's basis and, therefore, relief should be granted from the exercising requirements of Section XI for SI-604A and B. The licensee has shown that the only method to establish full flow through these valves is to take a suction on the sump with the HPSI pumps and inject into the RCS with the RCS at atmospheric pressure. This testing cannot be performed either during power operation or during cold shutdown since the RCS pressure will be greater than atmospheric pressure during those plant modes. Pumping the unknown quality sump water into the RCS during any plant mode is not practical. Therefore, the only practical method of exercising these valves with flow is by using the test connections. The test connections are only 3/4-inch lines which would not pass sufficient flow to provide a meaningful partial-stroke exercise for these 24-inch check valves.

3.3.2.3.4 Conclusion--Based on the considerations discussed above, the staff concludes that the proposed alternate testing will give reasonable assurance of valve operability as required by the Code and that the relief, thus granted, will not endanger life or property or the common defense and security of the public.

3.3.2.4 Relief Request. The licensee has requested relief from the exercising requirements of Section XI for SI-122A and B, the LPSI pump discharge check valves, and proposed to partial-stroke exercise these valves quarterly and during cold shutdowns by operating the LPSI pumps in the shutdown cooling warm-up loop and to full-stroke exercise the valves during each refueling outage.

3.3.2.4.1 Code Requirement--Refer to Appendix A.

3.3.2.4.2 Licensee's Basis for Requesting Relief--The operability testing (full-stroke) of these normally closed check valves per IWV-3520 requires flow verification into the RCS. These valves cannot be full-stroke exercised during power operation because the pumps cannot overcome RCS pressure. During cold shutdown, these valves cannot be full-stroke exercised because design flow cannot be verified through the valves unless all LOCA test conditions can be met (i.e., suction from the RWSP through the pumps to the RCS with the RCS at atmospheric pressure).

3.3.2.4.3 Evaluation--The staff agrees with the licensee's basis and, therefore, relief should be granted from the exercising requirements of Section XI for check valves SI-122A and B. The licensee has demonstrated that the only flow path that permits full-stroke exercising these valves with flow is from the LPSI pumps into the RCS, and the LPSI pumps do not produce sufficient head to overcome operating RCS pressure. During cold shutdowns full flow cannot be verified through these valves since RCS pressure would be above the LOCA test condition for discharge pressure (atmospheric pressure).

3.3.2.4.4 Conclusion--Based on the considerations discussed above, the staff concludes that the proposed alternate testing will give

reasonable assurance of valve operability as required by the Code and that the relief, thus granted, will not endanger life or property or the common defense and security of the public.

3.3.2.5 Relief Request. The licensee has requested relief from the exercising requirements of Section XI for SI-717A and B, the RWSP vacuum breaker valves, and proposed to manually full-stroke exercise these valves by hand on a quarterly frequency.

3.3.2.5.1 Code Requirement--IWV-3522(b) requires that if a normally-closed check valve is tested without flow through the valve, a mechanical exerciser shall be used to move the disk. The force or torque delivered to the disk by the exerciser must be limited as described in the Code.

3.3.2.5.2 Licensee's Basis for Requesting Relief--Due to the valve design, a mechanical exerciser cannot be used.

3.3.2.5.3 Evaluation--The licensee had demonstrated that the proposed alternate testing is the only practical means of exercising these valves and, therefore, relief should be granted from the exercising requirements of Section XI for check valves SI-717A and B. The licensee stated that the construction of these valves is such that a mechanical exerciser cannot be used; therefore, the only practical method available to exercise these valves is for an individual to fully open the valve by hand.

3.3.2.5.4 Conclusion--Based on the considerations discussed above, the staff concludes that the proposed alternate testing is the only practical method currently available to test these valves. This testing will give reasonable assurance of valve operability as required by the Code and the relief, thus granted, will not endanger life or property or the common defense and security of the public.

3.4 Containment Spray System

3.4.1 Category C Valves

3.4.1.1 Relief Request. The licensee has requested relief from the exercising requirements of Section XI for CS-128A and B, the containment spray header check valves, and proposed to disassemble and manually exercise one of these two valves at each refueling outage on a staggered sampling basis.

3.4.1.1.1 Code Requirement--Refer to Appendix A.

3.4.1.1.2 Licensee's Basis for Requesting Relief--The operability testing (full or partial stroke) of these normally closed check valves per IWV-3520 during power operation or cold shutdown is not practical. Stroking these valves with flow would require the spraying of containment resulting in unnecessary equipment damage. Valve disassembly (manual full-stroke) during power operation is not practical because the valves are inside containment. During cold shutdown, valve disassembly would require draining a portion of the system, which is beyond the scope of cold shutdown testing. An air test for flow verification would require either draining a portion of the system or risking the possibility of wetting equipment inside containment. Therefore, the air test is impractical. In general, performing any test during power operation which lowers the water level in the spray header below +149.5 feet MSL elevation places the plant under a limiting condition for operation (LCO) and may result in a plant shutdown.

3.4.1.1.3 Evaluation--The staff agrees with the licensee's basis and, therefore, relief should be granted from the exercising requirements of Section XI for CS-128A and B. The licensee has demonstrated that exercising these valves with flow would result in spraying water inside the containment which could damage equipment inside containment. Exercising the valves using air is not practical during operation or cold shutdown because it would require draining a portion of the system in order to prevent spaying water inside containment. Disassembly of these valves also requires partial drainage of the system which cannot be performed during power operations or cold shutdowns as explained above.

3.4.1.1.4 Conclusion--Based on the considerations discussed above, the staff concludes that the proposed alternate testing will give reasonable assurance of valve operability as required by the Code and that the relief, thus granted, will not endanger life or property or the common defense and security of the public.

3.5 Containment Atmosphere Control Systems

3.5.1 Category AC Valves

3.5.1.1 Relief Request. The licensee has requested relief from the exercising requirements of Section XI for the following valves and has proposed to manually exercise these valves by hand during each cold shutdown.

Valve	Function
CAR-102A	Containment atmospheric release supply check valve
CAR-102B	Containment atmospheric release supply check valve
CVR-102	Containment vacuum relief check valve
CVR-202	Containment vacuum relief check valve

3.5.1.1.1 Code Requirement--IWV-3522(b) requires that if a normally-closed check valve is tested without flow through the valve, a mechanical exerciser shall be used to move the disk. The force or torque delivered to the disk by the exerciser must be limited as described in the Code.

3.5.1.1.2 Licensee's Basis for Requesting Relief--Due to valve design, a mechanical exerciser cannot be used.

3.5.1.1.3 Evaluation--The licensee has demonstrated that the proposed alternate testing is the only practical means of exercising these valves and, therefore, relief should be granted from the exercising requirements of Section XI for check valves CAR-102A, CAR-102B, CVR-102, and CVR-202. The licensee stated that the construction of these valves is such that a mechanical exerciser cannot be used; therefore, the only practical method available to exercise these valves is for an individual to fully open them by hand.

3.5.1.1.4 Conclusion--Based on the considerations discussed above, the staff concludes that the proposed alternate testing is the only practical method currently available to test these valves. This testing will give reasonable assurance of valve operability as required by the Code and the relief thus granted will not endanger life or property or the common defense and security of the public.

3.6 Instrument Air System and Area Radiation Monitoring System

3.6.1 Category AC Valves

3.6.1.1 Relief Request. The licensee has requested relief from the exercising requirements of Section XI for IA-910 and ARM-104, the containment instrument air supply check valve and the containment radiation monitor check valve, and proposed to verify valve closure during the performance of the leak-rate tests at each refueling outage.

3.6.1.1.1 Code Requirement--Refer to Appendix A.

3.6.1.1.2 Licensee's Basis for Requesting Relief--Due to plant design, it is not practical to verify by any positive means, either directly or indirectly, the operability of these normally open check valves per the requirements of IWV-3522(a).

3.6.1.1.3 Evaluation--The staff agrees with the licensee's basis and, therefore, relief should be granted from the exercising requirements of Section XI for IA-910 and ARM-104. The only way to verify closure of these valves is by performing a leak test which is being done in conjunction with the Appendix J leak-rate test each refueling outage.

3.6.1.1.4 Conclusion--Based on the considerations discussed above, the staff concludes that the proposed alternate testing will give reasonable assurance of valve operability as required by the Code and that the relief, thus granted, will not endanger life or property or the common defense and security of the public.

3.7 Nitrogen Gas System

3.7.1 Category B Valves

3.7.1.1 Relief Request. The licensee has requested relief from the Section XI requirement of measuring the stroke times for the following valves and proposed to verify timely valve operation by observing flow from the appropriate nitrogen accumulator.

Valve	Description
NG-609	Nitrogen Accumulator I isolation.
NG-610	Nitrogen Accumulator II isolation.
NG-709	Nitrogen Accumulator III isolation.
NG-710	Nitrogen Accumulator IV isolation.
NG-809	Nitrogen Accumulator V isolation.
NG-810	Nitrogen Accumulator VI isolation.
NG-909	Nitrogen Accumulator VII isolation.
NG-910	Nitrogen Accumulator VIII isolation.

3.7.1.1.1 Code Requirement--Refer to Appendix A.

3.7.1.1.2 Licensee's Basis For Requesting Relief--No physical means exists to measure the stroke time of these solenoid-operated valves. These valves do not have position indicators. In addition, the stems are not visible from the exterior of the valves. Also, there is no critical limit on the stroke time. Valve design does not facilitate partial stroke testing.

3.7.1.1.3 Evaluation--The staff agrees with the licensee's basis and, therefore, relief should be granted from the stroke timing requirements of Section XI for the above listed solenoid operated valves. The licensee has shown that the construction of these valves does not provide a means to measure valve stroke times since the stems are not accessible and the valves do not have position indicators. Valve operability will be determined by verifying nitrogen flow from the appropriate nitrogen accumulator.

3.7.1.1.4 Conclusion--Based on the considerations discussed above, the staff concludes that the proposed alternate testing will give reasonable assurance of valve operability as required by the Code and that the relief thus granted will not endanger life or property or the common defense and security of the public.

3.8 Hydrogen Recombiner and Analyzer

3.8.1 Category B Valves

3.8.1.1 Relief Request. The licensee has requested relief from the Section XI requirement to measure the stroke times for the following valves and proposed to verify timely valve operation by observing hydrogen analyzer flow and the low flow alarm.

Valves	Function
HRA-101A and B	Containment atmosphere sample valves
HRA-102A and B	Containment atmosphere sample valves
HRA-103A and B	Containment atmosphere sample valves
HRA-104A and B	Containment atmosphere sample valves
HRA-105A and B	Containment atmosphere sample valves
HRA-106A and B	Containment atmosphere sample valves
HRA-201A and B	Containment atmosphere sample valves
HRA-202A and B	Containment atmosphere sample valves

3.8.1.1.1 Code Requirement--Refer to Appendix A.

3.8.1.1.2 Licensee's Basis for Requesting Relief--No physical means exists to measure the stroke times of these solenoid-operated valves. These valves do not have position indicators. In addition, the stems are not visible from the exterior of the valves. Also, there is no critical limit on the stroke time. Valve design does not facilitate partial-stroke testing.

3.8.1.1.3 Evaluation--The staff agrees with the licensee's basis and, therefore, relief should be granted from the stroke timing requirements of Section XI for the above listed solenoid-operated valves. The licensee has shown that the construction of these valves does not provide a means to measure valve stroke times since the stems are not accessible and the valves do not have position indicators. Valve operability will be determined by verifying system flow by observing that the low flow alarm clears after each valve is opened.

3.8.1.1.4 Conclusion--Based on the considerations discussed above, the staff concludes that the proposed alternate testing will give reasonable assurance of valve operability as required by the Code and that the relief, thus granted, will not endanger life or property or the common defense and security of the public.

APPENDIX A

1. CODE REQUIREMENTS--VALVES
2. CODE REQUIREMENTS--PUMPS

APPENDIX A

1. CODE REQUIREMENTS--VALVES

Subsection IWV-3411 of the 1980 Edition through winter 1981 addenda of the ASME Code Section XI (which discusses full-stroke and partial-stroke exercising requirements) requires that Code Category A and B valves be exercised once every 3 months, with exceptions as defined in IWV-3412(a), IWV-3415, and IWV-3416. IWV-3520 (which discusses full-stroke and partial-stroke exercising requirements) requires that Code Category C valves be exercised once every 3 months, with exceptions as defined in IWV-3522. In the above exceptions, the Code permits the valves to be tested at cold shutdown where:

1. It is not practical to exercise the valves to the position required to fulfill their function or to the partial position during power operation.

2. It is not practical to observe the operation of the valves (with failsafe actuators) upon loss of actuator power.

Subsection IWV-3413 requires all Category A and B power-operated valves to be stroke-time tested to the nearest second or 10% of the maximum allowable owner-specified time. Additionally, all Category A valves are required to be individually le rate tested and trended on a frequency not to exceed each 2 years in accordance with IWV-3420.

2. CODE REQUIREMENTS--PUMP

Section IWP-3400(a) of the 1980 edition through winter of 1981 addenda of the ASME Code calls for an inservice test to be conducted on all safety-related pumps nominally once every 3 months during normal plant operation. Each inservice test shall include the measurement, observation, and recording of all quantities in Table IWP-3100-1, except bearing temperature, which shall be measured during at least one inservice test each year.

APPENDIX B

P&ID LIST

APPENDIX B

P&ID LIST

The following is a list of P&IDs used during the review of the Waterford Steam Electric Station, Unit No. 3, IST program.

System	P&ID No.	Revision
Hydrogen Analyzer System	B-430 Sh.SP-01	3
Containment Vacuum Relief System	B-431 Sh.283S	2
Main and Extraction Steam System	G-151 Sh.1	13
Feedwater, Condensate, and Air Evacuation System	G-153 Sh.2	12
Instrument Air System	G-157 Sh.1	12
Component Closed Cooling Water System	G-160 Sh.1	13
Component Closed Cooling Water System	G-160 Sh.2	11
Component Closed Cooling Water System	G-160 Sh.3	18
Fire, Makeup and Domestic Water System	G-161 Sh.1	7
Makeup and Domestic Water System	G-161 Sh.2	7
Sampling System	G-162 Sh.2	7
Containment Spray System	G-163	10
Steam Generator Blowdown and Diesel Generator	G-164 Sh.1	8
Radiation Sampling and Diesel Generator Air	G-164 Sh.2	7
Turbine Building Miscellaneous Systems	G-165 Sh.3	7
N_2, H_2, and CO_2 Systems	G-166 Sh.1	15
Nitrogen Accumulators	G-166 Sh.2	3
Safety Injection System	G-167 Sh.1	14
Safety Injection System	G-167 Sh.2	13
Chemical and Volume Control System	G-168 Sh.1	10
Chemical and Volume Control System	G-168 Sh.2	9
Waste Management System	G-170 Sh.2	8
Boron Management System	G-171 Sh.1	8
Reactor Coolant System	G-172	7
Sump Pump System	G-173	10
Heating, Ventilation, and Air Conditioning System	G-853 Sh.1	5
Heating, Ventilation, and Air Conditioning System	G-853 Sh.2	6
Chilled Water System	G-853 Sh.3	8
Chilled Water System	G-853 Sh.4	8
Chilled Water System	G-853 Sh.5	6
Chilled Water System	G-853 Sh.6	11

APPENDIX C
VALVES TESTED DURING COLD SHUTDOWN

APPENDIX C
VALVES TESTED DURING COLD SHUTDOWN

The following are Category A, B, and C valves that meet the exercising requirements of the ASME Code, Section XI, and are not full-stroke exercised every 3 months during plant operation. These valves are specifically identified by the owner and are full-stroke exercised during cold shutdowns and refueling outages. The staff has reviewed all valves in this appendix and agrees with the licensee that testing these valves during power operation is not practical, due to the valve type, location or system design. These valves should not be exercised during power operation. These valves are listed below and grouped according to the system in which they are located.

1. REACTOR COOLANT SYSTEM

1.1 Category A Valve

RC-606, isolation valve on the seal water line from the reactor coolant pumps to the volume control tank, cannot be exercised during power operation since failure of the valve in the closed position would cause a loss of the seal water cooling function for the reactor coolant pumps which could damage the pumps and result in a reactor trip. This valve will be full-stroke exercised during cold shutdowns and refueling outages.

2. CHEMICAL AND VOLUME CONTROL SYSTEM

2.1 Category A Valves

CVC-401, isolation valve for the reactor coolant pump seal leak-off return to the volume control tank, cannot be exercised during power operation since failure of the valve in the closed position would cause a loss of the seal water cooling function for the reactor coolant pumps which could damage the pumps and result in a reactor trip. This valve will be full-stroke exercised during cold shutdowns and refueling outages.

CVC-103 and 109, isolation valves in the letdown line from the reactor coolant system, cannot be exercised during power operation since failure of either valve in the closed position would isolate letdown flow which would result in loss of pressurizer level control which could result in a reactor trip. Exercising these valves during power operation could also result in thermal shock to the regenerative heat exchanger. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

2.2 Category B Valves

BAM-113A and B, isolation valves in the lines from the boric acid make-up tanks to the charging pumps suction header, cannot be exercised during power operation since opening these valves during power operation could cause the injection of concentrated boric acid into the reactor coolant system which would result in a decrease in reactor power and possible plant shutdown. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

CVC-101, an isolation valve in the letdown line from the reactor coolant system to the regenerative heat exchanger, cannot be exercised during power operation since failure of the the valve in the closed position during testing would isolate letdown flow which would result in loss of pressurizer level control and possibly in a reactor trip. Exercising this valve during power operation could also result in thermal shock to the regenerative heat exchanger. This valve will be full-stroke exercised during cold shutdowns and refueling outages.

CVC-507, an isolation valve in the line from the RWSP to the charging pump suction header, cannot be exercised during power operation since opening this valve could permit water from the RWSP, which has a higher concentration of boric acid, to enter the charging pump suction header and be injected into the reactor coolant system which would result in a decrease in reactor power and a possible plant shutdown. This valve will be full-stroke exercised during cold shutdowns and refueling outages.

CVC-183, the isolation valve in the line from the volume control tank to the charging pump suction header, cannot be exercised during power operation since failure of the valve in the closed position during testing would isolate charging pump suction from the volume control tank which would cause a loss of pressurizer level control which could result in a reactor trip. Exercising this valve during power operation could also result in thermal shock to the regenerative heat exchanger. This valve will be full-stroke exercised during cold shutdowns and refueling outages.

CVC-216A and B, the isolation valves in the auxiliary pressurizer spray lines, cannot be exercised during power operation since opening these valves would initiate auxiliary pressurizer spray which would result in primary pressure transients and thermal shock to the pressurizer and associated piping and nozzles. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

2.3 Category C Valves

BAM-115 and 135, check valves in flow paths from the boric acid make-up tanks to the charging pump suction header, cannot be exercised during power operation since it would require establishing flow through the valves which would place concentrated boric acid in the charging pump suction header. Injection of this concentrated boric acid into the reactor coolant system would result in a decrease in reactor power and a possible plant shutdown. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

CVC-508, a check valve in the line from the RWSP to the charging pump suction header, cannot be exercised during power operation since this would require establishing flow through the valve which would introduce RWSP water with a high concentration of boric acid into the charging pump suction header. Injection of concentrated boric acid into the reactor coolant system would result in a decrease in reactor power and a possible plant shutdown. This valve will be full-stroke exercised during cold shutdowns and refueling outages.

CVC-217A and B, the pressurizer auxiliary spray line check valves, cannot be exercised during power operation since this would require establishing auxiliary spray flow into the pressurizer and the auxiliary spray flow would be approximately 140 degrees F cooler than the pressurizer which would thermal shock the spray piping and nozzle which could lead to premature failure of these components. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

BAM-129A and B, the boric acid pumps discharge check valves, cannot be exercised during power operation since the only full-flow path would result in the injection of concentrated boric acid into the reactor coolant system which would cause a reduction in reactor power and possibly a plant shutdown. These valves cannot be partial-stroke exercised during power operation since it would require pumping from the boric acid make-up tanks to the RWSP which would place concentrated boric acid in lines that are not heat-traced which could result in clogging of the lines and loss of one of the emergency boration flow paths. Flushing these lines after testing could result in an overboration or a dilution in the reactor coolant system thereby causing reactor power fluctuations. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

CVC-219, the normal charging to the reactor coolant system bypass check valve, cannot be exercised during power operation since it would require closing both normal charging valves, and a failure of this valve to open under those conditions would result in an interruption of charging flow which could cause thermal shock to the regenerative heat exchanger and a loss of pressurizer level control. This valve will be full-stroke exercised during cold shutdowns and refueling outages.

3. SAFETY INJECTION SYSTEM

3.1 Category A Valves

The following safety injection tank vent valves cannot be exercised during power operation since opening any of these valves would result in a decrease in pressure in the associated safety injection tank which could

render that tank unable to perform its safety function. A failure of a vent valve in the open position during testing would render the associated safety injection tank inoperable. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

Valves	Function
SI-323A and 325A	Safety injection tank 1-A vent valves
SI-323B and 325B	Safety injection tank 1-B vent valves
SI-324A and 326A	Safety injection tank 2-A vent valves
SI-324B and 326B	Safety injection tank 2-B vent valves

SI-401A, 401B, 405A, and 405B, the isolation valves in the shutdown cooling suction lines from the reactor coolant system, cannot be exercised during power operation since there is an interlock associated with reactor coolant system pressure which prevents the valves from opening when reactor coolant system pressure is greater than 400 psig in order to prevent overpressurization of the shutdown cooling system. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

4. FEEDWATER SYSTEM

4.1 Category B Valves

FW-184A and B, the feedwater isolation valves, cannot be full-stroke exercised during power operation since closing these valves would interrupt feedwater flow to the steam generators which would cause a loss of steam generator water level control and possibly a plant shutdown. These valves will be partial-stroke exercised (10% stroke) quarterly and will be full-stroke exercised during cold shutdowns and refueling outages.

FW-166A and B, the bypass valves for the main feedwater control valves, cannot be exercised during power operation since stroking these valves will affect the steam generator water level control system and could disturb the steam generator level sufficiently to cause a turbine and reactor trip. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

EFW-220A and B, the emergency feedwater blowdown isolation valves, cannot be exercised during power operation since a failure of one of these valves in the open position would divert a portion of the emergency feedwater flow from the steam generators if the emergency feedwater system were required to operate due to a change in plant conditions. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

FW-179A and B, the main feedwater blowdown isolation valves, cannot be exercised during power operation since these valves are electrically interlocked with EFW-220A and B and the emergency feedwater blowdown isolation valves cannot be exercised during power operation since this could result in the partial diversion of emergency feedwater flow from the flow path necessary to perform its function important to safety. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

FW-173A and B, the main feedwater control valves, cannot be full-stroke exercised during power operations since closing these valves would interrupt feedwater flow to the steam generators causing a loss of steam generator water level control and possibly a plant shutdown. These valves will be partial-stroke exercised quarterly during power operations and will be full-stroke exercised during cold shutdowns and refueling outages.

4.2 Category C Valves

EFW-207A, 207B, 2191A, and 2191B, the motor driven emergency feedwater pump discharge check valves and combined header discharge check valves respectively, cannot be full-stroke exercised during power operations since the only method available to verify a full-stroke of these valves is to establish design emergency feedwater flow into the steam generators which could result in thermal shock to the steam generators and to the feedwater piping and nozzles. An introduction of colder emergency feedwater into the steam generators will also cause power transients. Partial-stroke exercising of these valves cannot be performed during power operations since establishing the flow path would also provide a path that would partially divert emergency feedwater flow if it were needed to perform its function important to safety. These valves will be full-stroke exercised during startup from cold shutdowns and refueling outages.

EFW-207A/B, the turbine driven emergency feedwater pump discharge check valve, cannot be full-stroke exercised during power operations since the only flow path available to verify a full-stroke of this valve with flow is into the steam generators which could cause thermal shock in the steam generator and in the feedwater piping and nozzles. An introduction of colder emergency feedwater into the steam generators would also cause a power transient. Partial-stroke exercising of this valve cannot be performed during power operations since establishing the flow path would also provide a path that could partially divert emergency feedwater flow if it were needed to perform its function important to safety. This valve will be full-stroke exercised during startup from cold shutdowns and refueling outages.

5. MAIN STEAM SYSTEM

5.1 Category B Valves

MS-116A and B, the main steam atmospheric dump valves, cannot be exercised during power operations since opening either of these valves would dump steam to the atmosphere which would cause transients in both the primary and secondary systems. Failure of one of these valves in the open position during testing would result in a plant shutdown. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

MS-124A and B, the main steam isolation valves (MSIVs), cannot be full-stroke exercised during power operations since closing one of these valves would interrupt steam flow from the associated steam generator which would result in a plant shutdown. These valves will be partial-stroke exercised quarterly and will be full-stroke exercised during cold shutdowns and refueling outages.

5.2 Category C Valves

MS-402A and B, check valves in the lines from the main steam headers to the turbine for the turbine driven emergency feedwater pump, cannot be full-stroke exercised during power operations since it would be necessary to deliver full design emergency feedwater flow from EFW pump A/B to the steam generators in order to verify that these valves are full-stroke exercised, which would thermal shock feedwater piping and nozzles and cause power fluctuations. These valves will be partial-stroke exercised during startup from cold shutdowns and refueling outages and will be pressure tested with air, to verify their ability to perform their function important to safety in the closed position, during cold shutdowns and refueling outages.

6. COMPONENT COOLING WATER SYSTEM

6.1 Category A Valves

CC-641, 710, and 713, isolation valves in the component cooling water lines to the reactor coolant pumps and the control element drive mechanisms (CEDMs), cannot be exercised during power operations since cycling of these valves would interrupt the cooling water supply to the reactor coolant pumps and failure of a valve in the closed position during testing would result in the loss of cooling water to the reactor cooling pumps and the CEDMs. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

6.2 Category B Valves

The following component cooling water valves cannot be exercised during power operations since failure of one of these valves in the closed position during testing would result in the loss of at least one containment cooler, which are all required to remain operable by the plant technical specifications. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

Valves	Function
CC-808A and 822A	Isolation valves for containment fan cooler 3A-SA
CC-807B and 823B	Isolation valves for containment fan cooler 3B-SB
CC-807A and 823A	Isolation valves for containment fan cooler 3C-SA
CC-808B and 822B	Isolation valves for containment fan cooler 3D-SB
CC-835A	CCW flow control valve for containment fan coolers 3A-SA and 3C-SA
CC-835B	CCW flow control valve for containment fan coolers 3B-SB and 3D-SB

7. CONTAINMENT ATMOSPHERE CONTROL SYSTEM

7.1 Category AC Valves

CAR-102A and B, the containment atmospheric release (CAR) supply check valves, cannot be exercised during power operation. Operability testing (full or partial-stroke) of these normally-closed check valves requires flow verification utilizing the CAR make-up fans with the manual butterfly valves open. Since the isolation valves in line with these check valves do not receive a containment isolation actuation signal, there exists a possible unmonitored radiation release path should a containment isolation occur while the testing is in progress. These valves will be manually full-stroke exercised during cold shutdowns and refueling outages.

CVR-102 and 202, the containment vacuum relief check valves, cannot be exercised during power operations since exercising the valves with flow would require that the annulus be pressurized and the plant Technical Specifications require that the annulus be maintained at a vacuum during power operations. These valves will be manually full-stroke exercised during cold shutdowns and refueling outages.

8. INSTRUMENT AIR SYSTEM

8.1 Category A Valve

IA-909, the containment instrument air supply isolation valve cannot be exercised during power operation since cycling this valve would cause an interruption of instrument air to instruments and equipment inside containment and failure of the valve in the closed position during testing

would cause a complete loss of instrument air to equipment inside containment. This valve will be full-stroke exercised during cold shutdowns and refueling outages.

9. AREA RADIATION MONITORING SYSTEM

9.1 Category A Valves

ARM-103, 109, and 110, the containment atmosphere radiation monitor isolation valves, cannot be exercised during power operation since cycling these valves interrupts air flow to the radiation monitor and failure of one of these valves in the closed position during testing would cause a loss of the containment atmosphere radiation monitoring system. These valves will be full-stroke exercised during cold shutdowns and refueling outages.

APPENDIX D

IST PROGRAM ANOMALIES FOUND DURING THE REVIEW

APPENDIX D

IST PROGRAM ANOMALIES FOUND DURING THE REVIEW

Inconsistencies and omissions in the licensee's program noted during the course of this review are summarized below. The licensee should resolve these items in accordance with the evaluations, conclusions, and guidelines presented in this report.

1. Section XI, Paragraph IWV-3420 establishes the criteria for leak rate testing Category A and A/C valves. The licensee has indicated in the body of the IST program that selected Category A and A/C valves are leak-rate tested according to 10CFR50 Appendix J, but no relief was sought to use Appendix J vice those of the Code. Though Appendix J leak-rate testing is acceptable to the Staff, relief must be sought and granted before the licensee can substitute Appendix J for the Code requirements. If the licensee desires to leak rate test selected valves according to Appendix J, a single relief covering Paragraphs IWV-3421 through 3425 for all valves concerned may be submitted to the Staff for approval.
Except for valves where other specific reliefs have been granted, ALL Category A and A/C valves must be leak-rate tested according to the Code requirements until such time that a relief request to leak-rate test using Appendix J criteria is submitted and approved by the Staff.

2. The licensee has requested relief from the requirements of Section XI, Paragraph IWV-3411 for the following valves which are normally closed and passive. IWV-3700 states that there are no inservice test exercising requirements for passive valves. Therefore, relief from IWV-3411 is not required.

Valve	Description
SI-344	SIT drain to RWSP.
CAR-101A/B	CAR supply isolation
CAR 202A/B	CAR exhaust isolation
SA-908	Cont. station air supply isolation
LRT-109	Cont. leakrate test isolation
LRT-201/202	Integrated leak test pressure tap.
LRT 203/204	Controlled leak test bleed-off.
FS-405/406	Refueling cavity inlet isolation.
FS-415/416	Refueling cavity drain pump iso.
CMU-244	Condensate supply to cont.
PMU-151	Primary makeup to cont.

3. The licensee has requested relief from the requirements of Section XI, Paragraph IWV-3413 for the following valves which are pressure regulating valves. IWV-1200 exempts pressure regulating valves from the requirements of Section XI; therefore, relief is not necessary for these valves.

Valve	Description
NG-611	Nitrogen pressure regulator.
NG-612	Nitrogen pressure regulator.
NG-711	Nitrogen pressure regulator.
NG-712	Nitrogen pressure regulator.
NG-811	Nitrogen pressure regulator.
NG-812	Nitrogen pressure regulator.
NG-911	Nitrogen pressure regulator.
NG-912	Nitrogen pressure regulator.

NRC FORM 328
(2-84)
NRCM 1102
3201, 3202

U.S. NUCLEAR REGULATORY COMMISSION

BIBLIOGRAPHIC DATA SHEET

SEE INSTRUCTIONS ON THE REVERSE

REPORT NUMBER (Assigned by NRC, add Vol., Supp., Rev.)
EGG-NTA-7078
Revision 1

2. TITLE AND SUBTITLE
TECHNICAL EVALUATION REPORT, PUMP AND VALVE INSERVICE TESTING PROGRAM, WATERFORD STEAM ELECTRIC STATION, UNIT 3

3. LEAVE BLANK

4. DATE REPORT COMPLETED
MONTH: October | YEAR: 1988

5. AUTHOR(S)
C. B. Ransom, T. L. Cook, H. C. Rockhold, W. C. Hemming

6. DATE REPORT ISSUED
MONTH: October | YEAR: 1988

7. PERFORMING ORGANIZATION NAME AND MAILING ADDRESS (Include Zip Code)
Regulatory & Technical Assistance
EG&G Idaho, Inc.
P. O. Box 1625
Idaho Falls, ID, 83415

8. PROJECT/TASK/WORK UNIT NUMBER

9. FIN OR GRANT NUMBER
A6812

10. SPONSORING ORGANIZATION NAME AND MAILING ADDRESS (Include Zip Code)
Mechanical Engineering Branch
ffice of Nuclear Reactor Regulation
.S. Nuclear Regulatory Commission
Washington, DC, 20555

11a. TYPE OF REPORT
Technical Evaluation Report

b. PERIOD COVERED (Inclusive dates)

12. SUPPLEMENTARY NOTES

13. ABSTRACT (200 words or less)

This EG&G Idaho, Inc. report presents the results of our evaluation of the Waterford Steam Electric Station, Unit 3, Inservice Testing Program for pumps and valves that perform a safety-related function.

14. DOCUMENT ANALYSIS - a. KEYWORDS/DESCRIPTORS

b. IDENTIFIERS/OPEN-ENDED TERMS

15. AVAILABILITY STATEMENT
Unlimited

16. SECURITY CLASSIFICATION
(This page)
Unclassified
(This report)
Unclassified

17. NUMBER OF PAGES

18. PRICE