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TECHNICAL EVALUATION REPORT
PUMP AND VALVE INSERVICE TESTING PROGRAM
FORT CALHOUN STATION UNIT 1

Docket Number 50-285

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ABSTRACT

This report presents the results of our evaluation of the Fort Calhoun Station, Unit 1, 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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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 the Fort Calhoun Station, Unit 1, submitted by Omaha Public Power District.

Section 2 presents Omaha Public Power District'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 summary of the evaluations of deferred test justifications that involve the frequency of testing safety-related valves.

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

1.1 IST Program Description

Omaha Public Power District (OPPD) submitted their Third 120 month Inspection Interval IST program with a letter to the Nuclear Regulatory Commission (NRC) dated November 13, 1992. The IST program covers the third ten-year interval starting September 26, 1993, and ending September 25, 2003. The relief requests pertain to 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). OPPD 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 of Section XI provides that the rules for IST of pumps and valves are as specified 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 Containment Spray, Chemical and Volume Control, Steam Generator Feedwater, and Safety Injection 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.

OPPD provided several deferred test justifications for exercising Category A, B, and C valves during cold shutdowns and refueling outages instead of quarterly. Valves identified to be tested during cold shutdowns need not be tested if testing was performed within three months of the cold shutdown in accordance with IWV-3412(a) and -3522. These justifications were reviewed and appear to be acceptable except as noted in Section 4 of this report and in Appendix A.

2. PUMP TESTING PROGRAM

The following relief requests are 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 each relief request followed by the licensee's basis for relief and the evaluation with the reviewer's recommendations. The requests are grouped according to topic or system.

2.1 General Pump Request

2.1.1 Inlet and Differential Pressure Determination

2.1.1.1 Relief Request. Pump Relief Request E1 requests relief from the direct measurement of differential pressure requirement of OM-6, Subsection 4.6.2.2, for the raw water, low pressure safety injection (LPSI), high pressure safety injection (HPSI), containment spray (CS), and boric acid pumps, which do not have installed inlet pressure instruments. The licensee proposes to determine pump inlet pressure and differential pressure by calculating the pressure due to the head of water above the pump inlet.

2.1.1.1.1 Licensee's Basis for Requesting Relief--The following text is quoted from pump relief request E1 in the Fort Calhoun Station Third Inspection Interval IST Program dated November 13, 1992:

> System design does not include instrumentation for direct measurement of inlet and differential pressure.
>
> Alternate Testing: The raw water pump inlet pressure will be calculated based on the river level and the elevation of the pump suction bells. The pump differential pressure will then be calculated based on the measured discharge pressure and the calculated inlet pressure. Since (1) the river provides the required positive pressure at the suction of the pumps, (2) the river level does not change when a pump is started, and (3) at least one pump is usually in service, the calculated inlet pressure prior to starting a pump is the same as with a pump running.
>
> The LPSI, HPSI and CS pumps take their suction directly from the Safety Injection and Refueling Water Tank and have inlet pressures due to the level of water in the tank above the pump inlets. The pump inlet pressures will be calculated based on the tank level and the difference in elevation between the tank and the pump inlets. Pump differential pressures will then be calculated by subtracting the calculated inlet pressure from the measured discharge pressures. Since the Safety Injection and Refueling Water Tank provides the required positive pressure at the suction of the pumps and since the tank level does not significantly change when a pump is started, the calculated pump inlet pressure prior to starting a pump is the same as with a pump running. Flow losses through the suction piping of these pumps are negligible. Since the losses would be the same from test to test, not including them in the test would still enable pump degradation to be identified.
>
> The Boric Acid Pumps take their suction directly from the Boric Acid Tanks and have an inlet pressure due to the level of acid in the tanks above the pump inlet. The pump

inlet pressure will be calculated based on the Boric Acid Storage Tank level and the elevation difference between the tank level and the pump inlet. Pump differential pressure will then be calculated by subtracting the calculated inlet pressure from the measured discharge pressure.

2.1.1.1.2 Evaluation--OM-6 does not require the measurement of pump inlet pressure as a separate parameter. However, Subsection 4.6.2.2 requires that differential pressure be determined using a gauge or differential pressure transmitter that provides a direct measurement of the pressure difference between the pressure at a point in the inlet pipe and the pressure in the discharge pipe. The Code requires measurement of differential pressure to help assess pump hydraulic condition and detect degradation.

The differential pressure of these pumps cannot be directly measured because there are no installed direct reading differential pressure or inlet pressure instruments. The raw water pumps are submerged and inaccessible, so direct reading inlet pressure sensors can not be installed. In addition, significant system modifications would be necessary to provide direct measurement of differential pressure on all of the listed pumps. The inlet pressure of these pumps is due to the head of water above the level of the pump suction. The licensee's proposal to determine inlet pressure by measuring the height of fluid above the pump suction and to calculate differential pressure using this inlet pressure and the measured discharge pressure should allow them to adequately assess pump hydraulic condition and degradation. However, the calculations should be within the accuracy that would result from installed instrumentation meeting the Code accuracy requirements. Requiring the licensee to make system modifications to directly measure pump differential pressure would be a hardship and it would provide only a limited amount of additional information.

If the differential pressure determination is within the accuracy that would result from installed instrumentation meeting the Code accuracy requirements, the calculated differential pressure in conjunction with the measured flow rate should provide adequate information for monitoring the hydraulic condition of the pump and permit detection of degradation. Therefore, the proposed alternative should provide reasonable assurance of pump operational readiness.

Based on the determination that compliance with the Code requirements is a hardship without a compensating increase in the level of quality and safety, we recommend that the alternative be authorized pursuant to 10 CFR 50.55a(a)(3)(ii).

2.2 Charging Pumps

2.2.1 Pump Flow Rate Acceptance Criteria

2.2.1.1 Relief Request. Pump Relief Request E3 requests relief from the flow rate acceptance criteria requirements of OM-6, Subsection 6.1 and Table 3b, for the charging pumps, CH-1A, -1B, and -1C. The licensee proposes to not have an Alert Range for these pumps and to set the Required Action Range at <35 gpm and >40 gpm.

2.2.1.1.1 Licensee's Basis for Requesting Relief--The following text is quoted from pump relief request E3 in the Fort Calhoun Station Third Inspection Interval IST Program dated November 13, 1992:

> There is no minimum flow rate mentioned in the USAR for the charging pumps. A maximum flow rate of 40 gpm per pump is identified in the post-LOCA long term cooling section of the USAR. The reference flow rate value associated with these pumps is approximately 38 gpm. The charging pumps are positive displacement (reciprocating) type pumps. The flow rates for the charging pumps are established by the geometry of the positive displacement pump. The flow rate is a direct function of the amount of water displaced by the pump plungers with a constant speed pump.
>
> Alternate Testing: The discharge pressure for each pump will be set and recorded, then the flow rate measured Quarterly. The acceptable range for flow will be $35 \leq Q \leq 40$. The "Required Action" range will be <35 gpm and >40 gpm. It is not crucial to double the frequency as flow rates approach 35 gpm because there is no minimum required flow rate given in the USAR, and unless instrumentation has drifted out-of-calibration or test conditions have changed, the flow rate should not increase.

2.2.1.1.2 Evaluation--OM-6, Subsection 6.1, requires that when test measurements fall within the Alert Range limits of Table 3, the frequency of testing be doubled until the cause of the deviation is determined and the condition is corrected. This corrective action is required because entering the alert range indicates significant pump degradation or problems that warrant concern and more frequent testing to monitor pump condition, but the condition is not yet severe enough to require declaring the pump inoperable.

The licensee proposed to use alternate acceptance criteria to evaluate the charging pump flow rates. The following compares the licensee's proposed alternate against the Code acceptance criteria given a reference flow rate of 38 gpm:

	Acceptable Range	Alert Range	Required Action Range
Code Ranges	36.1 to 41.8 gpm*	35.3 to 36.1 gpm	<35.3 gpm, >41.8 gpm*
Proposed Ranges	35.0 to 40.0 gpm	None	<35.0 gpm, >40.0 gpm

*This is the Required Action Range, high, limit as determined from Table 3b, however, operational constraints for reasons other than IST may limit flow rate to a lower value.

The proposed Required Action Ranges do not differ significantly from the Code ranges, however, the proposed Acceptable and Alert Ranges are non-conservative in comparison with the Code requirements. The licensee's justification supporting this deviation from the Code is that there is no minimum flow rate mentioned in the USAR for the charging pumps.. However, the criteria of Table 3 are not based on specified system operational requirements, they are based on an amount of pump degradation that causes concern about pump operational readiness. These limits should not be ignored unless it can be shown that they may not be indicative of pump degradation that could increase the likelihood of the pump not being capable of performing its safety function if called on to do so.

Based on the determination that the licensee has not shown that compliance with the Code requirements is impractical, a hardship without a compensating increase in the level of quality and safety, or that the proposed alternative provides an equivalent level of quality and safety as provided by the Code; we recommend that relief be denied.

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.

3.1 Various Systems

3.1.1 Thermal Relief Valves

3.1.1.1 Relief Request. Valve Relief Request G1 requests relief from the scope of OM-1, Subsection 1.1, for thermal relief valves on safety-related systems. The licensee proposes to control the testing of these valves under their preventive maintenance program.

3.1.1.1.1 Licensee's Basis For Requesting Relief--The following text is quoted from relief request G1 in the Fort Calhoun Station Third Inspection Interval IST Program dated November 13, 1992:

> The O&M Code Part 1 provides general requirements for periodic performance testing and monitoring of pressure relief devices utilized in nuclear power plant systems which are required to perform a specific function in shutting down a reactor or in mitigating the consequences of an accident. Thermal relief valves will not be tested in accordance with O&M Part 1 guidance as part of the FCS ISI Program Plan, as FCS has determined that the thermal relief valves do not fully meet the intent of the scope of O&M Part 1. Many safety related systems, particularly those with heat exchangers, have been provided with relief valves. These relief valves are thermal relief valves of small capacity intended to relieve pressure due to a thermal expansion of fluid in a "bottled up" condition, which is considered a self-limiting transient. Experience has shown that failure of these valves will not result in a failure of the system to fulfill its safety function. Thus, most thermal relief valves are not considered to perform a function "important to safety", and as such have not been included in the FCS ISI Program Plan.
>
> Alternate Testing: Tests and test frequency for thermal relief valves will be controlled under the FC Preventive Maintenance (PM) Program and be conducted in a similar manner as the FCS ISI Program Plan.

3.1.1.1.2 Evaluation--In Paragraph IWV-1100 of the 1986 edition of Section XI, the Code committee increased the scope of the valves subject to IST to include those valves which protect certain Code-Class safety-related systems from overpressure. Pressure relief valves which are installed in the applicable systems to protect against overpressure may not typically perform a "safety-related" function. However, these valves are now required to be included in the IST program and be tested according to the schedules stipulated in OM-1-1981 or OM-1-1987 "Requirements for Inservice Performance Testing of Nuclear Power Plant Pressure Relief Devices."

Thermal relief valves installed to protect portions of safety-related systems against overpressure may be included in this expanded scope. The relief valves that may be involved are those that meet the following criteria: a) they protect a portion of a safety-related system, b) the protected piping and/or component may be isolated during a plant operating mode where credit is taken for operation of the safety-related system, c) the protected section is subject to a mechanism that could overpressurize it when isolated, and d) the integrity of the protected section (e.g., the absence of a rupture or stuck open relief valve) is required for the system to meet its safety function. A failure of the relief valve to protect the safety-related system under these conditions could result in an undetected failure of the isolated section of the system that renders it inoperable. Valves that protect portions of safety-related systems that would not normally be isolated except for maintenance or other activities should not be included in the expanded scope. When these thermal relief valves are relied on to perform their function, the associated safety-related system is not in service and is not expected to be capable of performing its safety-related function until it has been tested and returned to service.

Because some of the thermal relief valves at Fort Calhoun Station may be included in the expanded scope as discussed above, we recommend that general relief not be granted as requested for all thermal relief valves. The licensee should justify exclusion of those thermal relief valves that do not protect portions of safety systems that may be isolated during a plant operating mode where credit is taken for operation of the safety-related system. Relief valves that protect portions of safety-related systems that may be isolated during a plant operating mode where credit is taken for operation of the system should be included in the IST program and tested to the Code requirements.

3.1.2 Leak Test Containment Isolation Valves (CIVs)

3.1.2.1 Relief Request. Valve Relief Request E5 requests relief from the leak rate testing requirements of OM-10, Subsection 4.2.2.2, for the CIVs listed in the relief request. The licensee proposes to measure, record, and trend the leakage rate of these valves by penetration by pressurizing between the valves, which will apply pressure in the direction opposite to the design function for some of the valves.

3.1.2.1.1 Licensee's Basis For Requesting Relief--The following text is quoted from relief request E5 in the Fort Calhoun Station Third Inspection Interval IST Program dated November 13, 1992:

> These valves are tested in accordance with 10 CFR 50, Appendix J by pressurizing between the valves as permitted by IWV-3424(b), versus pressurizing the valves in the same direction as when the valves are performing their function as noted in IWV-3422. The valves cannot be tested in the direction of their design function due to system configuration, without extensive modifications to the piping system adjacent to each valve. These valves must be tested in pairs. Testing of these valves in the reverse direction results in higher leakage rates than testing in the accident direction. This is a more conservative approach to testing. Testing between the valves does not allow leak rate trending by valve.

Alternate Testing: The valves marked with an asterisk will be leak tested in the direction opposite to the design function but in accordance with 10 CFR 50, Appendix J. Leak rates will be measured, recorded and trended by penetration.

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 reactor coolant system pressure isolation function shall additionally be tested in accordance with para. 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).

Appendix J states that: "The pressure shall be applied in the same direction as that when the valve would be required to perform its safety function, unless it can be determined that the results from the tests for a pressure applied in a different direction will provide equivalent or more conservative results." The licensee indicates in their basis for justification that "testing of these valves in the reverse direction results in higher leakage rates than testing in the accident direction." Therefore, it appears that the licensee is complying with the test pressure direction provisions of Appendix J, and relief is not required from these requirements.

Leak rate testing CIVs by penetration is permitted by Appendix J. Applying the analysis of leakage rates and corrective actions requirements of Paragraphs 4.2.2.3(e) and (f) does not prevent this test methodology, because both paragraphs establish requirements for both specific "valves or valve combinations." Since testing valve combinations is permitted by Appendix J and the applicable Paragraphs of OM-10, relief is not necessary for this test method as long as it is performed in accordance with all other applicable requirements of Appendix J and OM-10.

3.2 Safety Injection Systems

3.2.1 Category A/C Valves

3.2.1.1 Relief Request. Valve Relief Request E1 requests relief from the exercising frequency requirements of OM-10, Subsection 4.2.1.2, for the safety injection refueling water tank discharge check valves, SI-139 and -140. The licensee proposes to disassemble and inspect these valves once every other refueling outage.

3.2.1.1.1 Licensee's Basis For Requesting Relief--The following text is quoted from relief request E1 in the Fort Calhoun Station Third Inspection Interval IST Program dated November 13, 1992:

> These check valves function to prevent backflow to the Safety Injection and Refueling Water Tank (SIRWT). These check valves are located in the lines leading from the SIRWT to the suctions of the Containment Spray (CS) pumps, the Low Pressure Safety Injection (LPSI) pumps and the High Pressure Safety Injection (HPSI) Pumps. The check valves under certain accident conditions must open sufficiently to provide design basis flow to all of these pumps. Because of this requirement the system

design full-stroke exercising of these check valves Quarterly or during Cold Shutdowns cannot be performed. During power operation, no full flow path exists for the combination of pumps because the HPSI and LPSI pumps cannot overcome the RCS pressure, and the CS system cannot be permitted to spray down the Containment. No full flow path is available during Cold Shutdowns because operating the HPSI pumps could create a low-temperature overpressurization condition in the RCS. CS cannot be used because the Containment would be sprayed down. Additionally it is not possible to achieve the maximum design accident flow through the check valves during full flow exercising.

The corrective maintenance history of these two check valves has been limited to gasket/bolt/nut replacements since installation. In addition, the check valves are 20 inch stainless steel Mission-Duochek type valves which see very little flow during normal operations. OPPD has previously disassembled and inspected each of these check valves once with the results being that the check valves were "like new". The industry has experienced no failures with these type of check valves in similar applications at other facilities. The disassembly and subsequent inspection of these valves requires unnecessary radiation exposure as well as creating significant (i.e., greater than 50 gallons) liquid radwaste requiring disposal. Also, frequent disassembly and reassembly of the valves (i.e., every Refueling Outage) introduces unnecessary potential for valve failure due to damage caused by maintenance without providing a commensurate increase in plant safety or check valve reliability.

Alternate Testing: OPPD will require check valves SI-139 and SI-140 to be alternately disassembled and inspected every other Refueling Outage. This sample disassembly of these check valves is in accordance with the NRC guidelines established in Generic Letter 89-04, Attachment 1, Position 2. This method of sample disassembly and inspection will ensure that each check valve is disassembled and inspected at least once every six years and will help to maintain personnel exposure ALARA, while at the same time providing reasonable assurance that integrity, quality and the ability to detect component degradation are maintained.

3.2.1.1.2 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. This testing is to demonstrate that a valve is capable of moving to its safety function position(s) to assess its operational readiness. The licensee proposes to disassemble and inspect valves SI-139 and -140 on a sampling basis every other refueling outage (one valve will be disassembled every other refueling outage).

SI-139 and -140 are simple check valves in the suction lines for the ECCS pumps from the SIRWT. These valves do not have position indication, therefore, the only practicable conventional method of verifying a full-stroke exercise open is by verifying maximum design condition flow rate through them. It is impractical to verify design accident flow through these valves at any frequency because this would require simultaneously establishing LPSI and HPSI flow into the reactor coolant system (RCS) and CS flow into the CS headers. It is impractical to establish flow into the CS headers because this would result in spraying the containment, which could damage equipment inside containment. The LPSI and HPSI pumps cannot establish flow into the RCS during power operations because they do not develop sufficient head to overcome normal operating RCS pressure. It is impractical to establish LPSI and HPSI injection flow into the RCS during cold shutdowns because this could cause or contribute to low-temperature overpressurization of the RCS. The LPSI, HPSI, and CS pumps can be tested at full or substantial flow during refueling outages, however, it is impractical to establish the test flow paths that permit all of these pumps to simultaneously take their suction from the SIRWT through valves SI-139 and -140. Since it is impractical to verify design accident flow through these valves, the licensee's proposal to disassemble and inspect them may be the only practicable method to periodically verify their full-stroke exercise 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.

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, permits the use of a sampling program for identical valves in similar applications. GL 89-04 also provides a mechanism for extending the valve disassembly interval in cases of extreme hardship. The licensee's basis supports extending the disassembly interval based on the low failure rate of these specific valves and similar valves in the nuclear industry. However, the criteria for extending the interval in GL 89-04 requires the licensee to disassemble and inspect each valve in the group and to document in detail the valve condition and its capability of being full-stroke exercised. The request indicated that each valve had been disassembled and found to be "like new." Stating that a valve is "like new" may be a subjective evaluation unless supported by a quantitative assessment such as taking critical dimension measurements and comparing them with new valve baseline measurement data. The GL 89-04 interval extension criteria do not provide specific evaluation requirements (e.g., trending critical dimension measurements), however, the licensee's evaluation should be adequate to provide reasonable assurance that degradation is not occurring in the group valves at a rate that could result in a valve becoming incapable of performing its function prior to the next examination. The GL 89-04 interval extension criteria also require a review of the installation of each valve addressing the "EPRI Applications Guidelines for Check Valves in Nuclear Power Plants." It is not clear from the relief request that this review has been performed and that the installation of these valves is satisfactory from that respect.

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 valves SI-139 and -140 in lieu of disassembly and inspection. The licensee should consider methods such as using non-intrusive techniques (e.g., acoustics, ultrasonics, magnetics, radiography, or thermography) to verify a full-stroke of these check 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 valves SI-139 and -140 should be satisfied by testing instead of disassembly and inspection.

Disassembly and inspection is permitted by OM-10 and relief is granted to perform it on a sampling basis by GL 89-04, therefore, these valves may be disassembled and inspected every refueling outage on a sampling basis provided that it is performed in accordance with all of the provisions of GL 89-04. In addition, the disassembly interval may be extended if all of the interval extension criteria of GL 89-04, Position 2, are met.

3.2.2 Category C Valves

3.2.2.1 Relief Request. Valve Relief Request E2 requests relief from the exercising frequency requirements of OM-10, Subsection 4.2.1.2, for the ECCS pump suction check valves from the containment sump, SI-159 and -160. The licensee proposes to disassemble and inspect these valves once every other refueling outage.

3.2.1.1.1 Licensee's Basis For Requesting Relief--The following text is quoted from relief request E2 in the Fort Calhoun Station Third Inspection Interval IST Program dated November 13, 1992:

> These valves function to prevent backflow to the Containment lower level. These valves are backed up by motor operated isolation valves HCV-383-3 and HCV-383-4 which are normally closed, fail-as-is, and open only upon receipt of a containment Recirculation Actuation Signal (RAS). Due to system design, these valves cannot be partial-stroke or full-stroke exercised open during power operation, Cold Shutdown or Refueling Outage because the Containment sump is normally dry and there is no flow path available for testing. Full-stroke exercising these valves open requires that the Containment sump be filled with water and provided with a source of makeup water in addition to operating the CS pumps and the HPSI pumps at rated capacity. Therefore, system configuration renders flow testing of these valves impractical.
>
> The corrective maintenance history of these two check valves has been limited to gasket/bolt/nut replacements since installation. In addition, the check valves are 24 inch stainless steel Mission-Duochek type valves which see no flow during normal operations. OPPD has previously disassembled and inspected each of these check valves with the results being that the check valves were "like new". The industry has experienced no failures with this type of check valves in similar applications at other facilities. The disassembly and subsequent inspection of these valves requires unnecessary radiation exposure as well as creating significant (i.e., greater than 50 gallons) liquid radwaste requiring disposal, with minimal benefits. Also, frequent disassembly and reassembly of the valves (i.e., every Refueling Outage) introduces unnecessary potential for valve failure due to damage caused by maintenance without providing a commensurate increase in plant safety or check valve reliability.
>
> Alternate Testing: OPPD will require check valves SI-159 and SI-160 to be alternately disassembled and inspected every other Refueling Outage. This sample disassembly of these check valves is in accordance with the NRC guidelines established in Generic Letter 89-04, Attachment 1, Position 2 with the exception of partial-stroke exercising. This method of sample disassembly and inspection will ensure that each check valve is disassembled and inspected at least once every six years and will help to maintain personnel exposure ALARA, while at the same time providing reasonable assurance that the integrity, quality and the ability to detect component degradation is maintained.

3.2.1.1.2 Evaluation--OM-10 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. This testing is to demonstrate that a valve is capable of moving to its safety function position(s) to assess its operational readiness. The licensee proposes to disassemble and inspect valves SI-159 and -160 on a sampling basis every other refueling outage (i.e., one valve will be disassembled every other refueling outage).

SI-159 and -160 are simple check valves in the suction lines for the ECCS pumps from the containment sump. These valves do not have position indication, therefore, the only practicable conventional method of verifying a full-stroke exercise open is by verifying maximum design condition flow rate through them. It is impractical to verify design accident flow through these valves at any frequency because this would require filling the containment sump with water and simultaneously establishing HPSI flow into the RCS and CS flow into the CS headers. It is impractical to establish flow into the CS headers because this would result in spraying the containment, which could damage equipment inside containment. The HPSI pumps cannot establish flow into the RCS during power operations because they do not develop sufficient head to overcome normal operating RCS pressure. It is impractical to establish HPSI injection flow into the RCS during cold shutdowns because this could cause or contribute to low-temperature overpressurization of the RCS. The HPSI and CS pumps can be tested at full or substantial flow during refueling outages, however, it is impractical to establish the test flow paths that permit all of these pumps to simultaneously take their suction from the containment sump through valves SI-159 and -160. Since it is impractical to verify design accident flow through these valves, the licensee's proposal to disassemble and inspect them may be the only practicable method to periodically verify their full-stroke exercise 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.

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, permits the use of a sampling program for identical valves in similar applications. GL 89-04 also provides a mechanism for extending the valve disassembly interval in cases of extreme hardship. The licensee's basis supports extending the disassembly interval based on the low failure rate of these specific valves and similar valves in the nuclear industry. However, the criteria for extending the interval in GL 89-04 requires the licensee to disassemble and inspect each valve in the group and to document in detail the valve condition and its capability of being full-stroke exercised. The request indicated that each valve had been disassembled and found to be "like new." Stating that a valve is "like new" may be a subjective evaluation unless supported by a quantitative assessment such as taking critical dimension measurements and comparing them with new valve baseline measurement data. The GL 89-04 interval extension criteria do not provide specific evaluation requirements (e.g., trending critical dimension measurements), however, the licensee's evaluation should be adequate to provide reasonable assurance that degradation is not occurring in the group valves at a rate that could result in a valve becoming incapable of performing its function prior to the next examination. The GL 89-04 interval extension criteria also require a review of the installation of each valve addressing the "EPRI Applications Guidelines for Check Valves in Nuclear Power Plants." The request does not indicate that this review has been performed and that the installation of these valves is satisfactory from that respect.

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 valves SI-159 and -160 in lieu of disassembly and inspection. The licensee should consider methods such as using non-intrusive techniques (e.g., acoustics, ultrasonics, magnetics, radiography, or thermography) to verify a full-stroke of these check 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 valves SI-159 and -160 should be satisfied by testing instead of disassembly and inspection.

Disassembly and inspection is permitted by OM-10 and relief is granted to perform it on a sampling basis by GL 89-04, therefore, these valves may be disassembled and inspected every refueling outage on a sampling basis provided it is performed in accordance with all of the provisions of GL 89-04. In addition, the disassembly interval may be extended if all of the interval extension criteria of GL 89-04, Position 2, are met.

The licensee states in their proposed alternate testing that "the sample disassembly of these check valves is in accordance with the NRC guidelines established in Generic Letter 89-04, Attachment 1, Position 2 with the exception of partial-stroking." Position 2 states that "if possible, partial valve stroking quarterly or during cold shutdowns, or after reassembly must be performed." Not performing part-stroke exercising in accordance with Paras. 4.2.1.2(b) and (d) is acceptable if the licensee identifies the technical basis explaining why this testing is impractical. However, the part-stroke exercise after reassembly required by Position 2 is to demonstrate that the maintenance procedure (i.e., disassembling a valve and reassembling it) has been performed in a manner that has not rendered the valve incapable of performing its function. Not performing some form of post maintenance testing to verify proper reassembly of these valves following their disassembly and inspection is unacceptable. If a part-stroke exercise following reassembly is impractical, this should be identified in the program and an alternate proposed that offers reasonable assurance of the valve's operational readiness following the maintenance procedure. The post maintenance testing requirements of OM-10, Para. 3.4, must be met for the disassembly and inspection activity unless specific relief is requested and approved.

3.3 Containment Spray System

3.3.1 Category C Valves

3.3.1.1 Relief Request. Valve Relief Request E3 requests relief from the exercising frequency requirements of OM-10, Subsection 4.2.1.2, for the containment spray header check valves, SI-175 and -176. The licensee proposes to disassemble and inspect these valves once every other refueling outage.

3.3.1.1.1 Licensee's Basis For Requesting Relief--The following text is quoted from relief request E3 in the Fort Calhoun Station Third Inspection Interval IST Program dated November 13, 1992:

> These check valves are located inside Containment. These valves cannot be full-stroke or partial-stroke exercised open using system flow during any plant

operating conditions because the only flow path is into the CS headers and would result in spraying down the Containment, causing equipment damage and requiring extensive cleanup.

The corrective maintenance history of these two check valves has been limited to gasket/bolt/nut replacements since installation. In addition, the check valves are 12 inch stainless steel Mission-Duochek type valves which see no flow during normal operations. OPPD has previously disassembled and inspected each of these check valves with the results being that the check valves were "like new". The industry has experienced no failures with this type of check valves in similar applications at other facilities. The disassembly and subsequent inspection of these valves requires unnecessary radiation exposure with minimal benefits. Also, frequent disassembly and reassembly of the valves (i.e., every Refueling Outage) introduces unnecessary potential for valve failure due to damage caused by maintenance without providing a commensurate increase in plant safety or check valve reliability.

Alternate Testing: Check valves SI-175 and SI-176 will be alternately disassembled every other refueling outage. The sample disassembly of these check valves is in accordance with the NRC guidelines established in Generic Letter 89-04, Attachment 1, Position 2 with the exception of partial-stroking. This method of sample disassembly and inspection will ensure that each check valve is disassembled and inspected at least once every six years and will help to maintain personnel exposure ALARA, while at the same time providing reasonable assurance that the integrity, quality and the ability to detect component degradation is maintained.

3.3.1.1.2 Evaluation--OM-10 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. This testing is to demonstrate that a valve is capable of moving to its safety function position(s) to assess its operational readiness. The licensee proposes to disassemble and inspect valves SI-175 and -176 on a sampling basis every other refueling outage (i.e., one valve will be disassembled every other refueling outage).

SI-175 and -176 are simple check valves in the CS lines to the spray headers inside containment. These 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 rate through them. It is impractical to verify maximum accident flow through these valves at any frequency because the only full flow path through these valves is into the CS headers, therefore, this testing would require establishing full CS flow into the CS headers. Establishing flow into the CS headers would result in spraying the containment, which could damage equipment inside containment. Since it is impractical to verify design accident flow through these valves, the licensee's proposal to disassemble and inspect them may be the only practicable method to periodically verify their full-stroke exercise 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.

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, permits the use of a sampling program for identical valves in similar applications. GL 89-04 also provides a mechanism for extending the valve disassembly interval in cases of extreme hardship. The licensee's basis supports extending the disassembly interval based on the low failure rate of these specific valves and similar valves in the nuclear industry. However, the criteria for extending the interval in GL 89-04 requires the licensee to disassemble and inspect each valve in the group and to document in detail the valve condition and its capability of being full-stroke exercised. The request indicated that each valve had been disassembled and found to be "like new." Stating that a valve is "like new" may be a subjective evaluation unless supported by a quantitative assessment such as taking critical dimension measurements and comparing them with new valve baseline measurement data. The GL 89-04 interval extension criteria do not provide specific evaluation requirements (e.g., trending critical dimension measurements), however, the licensee's evaluation should be adequate to provide reasonable assurance that degradation is not occurring in the group valves at a rate that could result in a valve becoming incapable of performing its function prior to the next examination. The GL 89-04 interval extension criteria also require a review of the installation of each valve addressing the "EPRI Applications Guidelines for Check Valves in Nuclear Power Plants." It is not clear from the relief request that this review has been performed and that the installation of these valves is satisfactory from that respect.

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 valves SI-175 and -176 in lieu of disassembly and inspection. The licensee should consider methods such as using non-intrusive techniques (e.g., acoustics, ultrasonics, magnetics, radiography, or thermography) to verify a full-stroke of these check valves. This testing may be practical only at refueling outages. The licensee should perform their investigation and if a test method is found to be practicable, the IST requirements for valves SI-175 and -176 should be satisfied by testing instead of disassembly and inspection.

Disassembly and inspection is permitted by OM-10 and relief is granted to perform it on a sampling basis by GL 89-04, therefore, these valves may be disassembled and inspected every refueling outage on a sampling basis provided it is performed in accordance with all of the provisions of GL 89-04. In addition, the disassembly interval may be extended if all of the interval extension criteria of GL 89-04, Position 2, are met.

The licensee states in their proposed alternate testing that "the sample disassembly of these check valves is in accordance with the NRC guidelines established in Generic Letter 89-04, Attachment 1, Position 2 with the exception of partial-stroking." Position 2 states that "if possible, partial valve stroking quarterly or during cold shutdowns, or after reassembly must be performed." Not performing part-stroke exercising in accordance with Paras. 4.2.1.2(b) and (d) is acceptable if the licensee identifies the technical basis explaining why this testing is impractical. However, the part-stroke exercise after reassembly required by Position 2 is to demonstrate that the maintenance procedure (i.e., disassembling a valve and reassembling it) has been performed in a manner that has not rendered the valve incapable of performing its function. Not performing some form of post maintenance testing to verify proper reassembly of these valves following their disassembly and inspection is unacceptable. If a part-stroke exercise following reassembly is impractical, this should be identified in the program and an alternate proposed that offers reasonable assurance of the valve's operational readiness following the maintenance procedure. The post maintenance testing requirements of OM-10, Para. 3.4, must be met for the disassembly and inspection activity unless specific relief is requested and approved.

3.4 Auxiliary Feedwater System

3.4.1 Category C Valves

3.4.1.1 Relief Request. Valve request E6 requests relief from the test frequency requirements of OM-1, Subsection 1.3.5(b), for the auxiliary feedwater pump oil cooler relief valve, FW-1525. The licensee proposes to test this valve every third refueling outage.

3.4.1.1.1 Licensee's Basis For Requesting Relief--The following text is quoted from relief request E6 in the F rt Calhoun Station Third Inspection Interval IST Program dated November 13, 1992:

> The relief valve is the only one of its type and manufacturer in its respective group. The intent of the Code is that all Class 3 relief valves be tested at least once every ten years (Reference O&M Part 1, Subsection 1.3.5(b)). This intent will be met. The current Refueling Outage frequency is 18 months. A review of historical maintenance records reveals that there have been no maintenance problems which justify testing the relief valve every other refueling outage. The scope of O&M Part 1 is to verify valve operability and detect any degradation in valve performance.
>
> Alternate Testing: The relief valve will be tested every third refueling outage.

3.4.1.1.2 Evaluation--OM-1 establishes a sampling plan to test groups of relief valves of each type and manufacturer. The sampling plan requires part of the relief valves in a group to be tested during a time period (a minimum of 20% of the valves of each type and manufacturer within any 48 months) and requires testing of additional valves of that type and manufacturer if one or more of the tested valves fails the test. A sampling plan is used by OM-1 to eliminate the time, radiation exposures, etc. of testing 100% of the valves more frequently. The sampling technique allows this reduction in testing without a significant increase in the likelihood of an undetected failure. Proper operation of the valves in the test sample gives reasonable assurance that the other valves in the group are capable of performing their safety functions. Sampling provides this assurance because valves of the same type and manufacturer should be affected by the same degradation and failure mechanisms. Therefore, the testing of individual valves in the group can be reasonably extended to once every ten years because other valves from the group are being successfully tested more frequently. Testing a single valve once every ten years is not equivalent to testing a group of similar valves in a sampling plan as established by OM-1.

Relief valve FW-1525 is the only one of its type and manufacturer, therefore, it forms a one valve sample group. OM-1 requires a minimum of 20% of the valves of each type and manufacturer be tested within any 48 months. Therefore, FW-1525 is required to be tested every 48 months. The licensee proposes to test this valve once every third refueling outage. They state that the current refueling outage frequency is 18 months, therefore, the minimum time between tests of this valve would be 54 months. The 54 month period is not significantly longer than the 48 month period, therefore, this extension may be acceptable depending on the failure and repair record of this valve. If this valves does not require frequent adjustments or repairs, testing at the proposed frequency should provide an acceptable level of quality and safety.

Discussions with members of the Working Group on Safety and Relief Valves (OM-1) indicate that the working group did not consider one valve groups when writing the Code. It is the impression of the working group members contacted, that the working group's intent is to have this type of valve tested at least once every ten years. The working group will meet on June 20 and 21, 1994, and will include this issue on their agenda.

Based on the determination that the proposed alternate is not significantly different from the Code requirements and that it should provide reasonable assurance of valve operational readiness during the interim period; we recommend that the alternative be authorized pursuant to 10 CFR 50.55a(a)(3)(i) until the OM-1 Working Group clarifies this issue. After the working group has clarified their position on this issue, the licensee should either modify or delete relief request E6.

4. DEFERRED TEST EVALUATIONS

The following relief requests and deferred test justifications involve the frequency of testing safety-related valves. These requests and 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

Section XI, Paragraphs IWV-3411 and -3521, specifies that valves be exercised every three months except as provided by Paragraphs IWV-3412 and -3522, respectively. Paragraphs IWV-3412 and -3522 permit valve full-stroke exercising to be deferred until cold shutdowns if full-stroke operation is impractical during plant operation.

In rulemaking to 10 CFR 50.55a effective September 8, 1992, the 1989 Edition of ASME Section XI was incorporated in 10 CFR 50.55a(b). The 1989 Edition of Section XI provides that the rules for inservice testing of valves are as specified in OM-10. 10 CFR 50.55a(f)(4)(iv) provides that IST of valves may meet the requirements set forth in subsequent editions and addenda that are incorporated by reference in 10 CFR 50.55a(b), subject to the limitations and modifications listed, and subject to NRC approval. Portions of editions or addenda may be used provided that all related requirements of the respective editions or addenda are met.

OM-10, Paragraphs 4.2.1.2 and 4.3.2.2, permit deferral of full-stroke exercising until refueling outages when this exercising is not practicable during plant operation or cold shutdowns. The NRC staff imposed no limitations to OM-10 associated with the test frequency requirements. However, to utilize this provision of OM-10, the licensee must implement all related requirements, which include Paragraphs 4.3.2.2(h) and 6.2.

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 Section XI and/or OM-10. Accordingly, the licensee's proposed alternate testing is in compliance with either the Code or the rulemaking effective September 8, 1992. Therefore, we recommend that the proposed alternatives be approved pursuant to 10 CFR 50.55a(f)(4)(iv). If testing is deferred until refueling outages in accordance with OM-10, the licensee must implement all related requirements, which include Paragraphs 4.3.2.2(h) and 6.2. Whether all related requirements are met is subject to NRC inspection. 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, Section XI and OM-10 require 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. These 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 using 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, Items 3 and 4.

Table 4.1
DEFERRED TEST EVALUATIONS
FORT CALHOUN STATION

Item Number	Valve Identification	Justification for Deferring Valve Exercising	Proposed Alternate Testing	Evaluation of Licensee's Justification
J1	HPSI pump suction check valves: SI-100 and -113	These valves cannot be full-stroke exercised open quarterly during plant operation or during cold shutdowns, since to do so would require a flow path to the RCS. That flow path cannot be utilized during power operation because the HPSI pumps do not develop sufficient discharge pressure to overcome RCS pressure. This same flow path cannot be utilized during cold shutdowns because there is insufficient volume in the RCS to accommodate the flow required and a low temperature overpressure condition of the RCS could result.	Valves will be partial-stroke exercised using the minimum recirculation flow path quarterly during normal operations, and full-stroke exercised open during refueling outages. This method of partial-stroke exercising quarterly and full-stroke exercising open during refueling outages is in accordance with the guidance set forth in OM-10, Para. 4.2.1.2.	Full-stroke exercising these valves open quarterly or during cold shutdowns is impractical. Therefore, the alternate is in accordance with OM-10, Para. 4.3.2.
J2	Pressurizer power operated relief valves (PORVs): PCV-102-1 and -102-2	These valves can only be opened or closed when there is a pressure differential across the valve. The valves have solenoid pilot valves that control their actuation. Since valves of this type have a history in the industry of sticking open and the PORVs are not credited in the safety analysis for overpressure protection during power operations, it is impractical to stroke these valves quarterly during power operation. These valves cannot be partial-stroke tested because they are either fully opened or fully closed.	The PORVs will be stroke-timed in the open and closed direction during the transition to cold shutdown (primary plant pressure is between 350 - 450 psia and primary plant temperature is between 300 - 350°F) prior to entering Mode 4. The PORVs will be tested during the transition from hot shutdown to cold shutdown, as defined by FCS TS whenever practical, i.e., normal plant shutdown. During a TS mandated shutdown, the PORVs will be tested during plant startup prior to entering Mode 2 (when primary plant pressure is between 350 - 450 psia and primary plant temperature is between 300 - 350°F).	It is impractical to exercise these valves quarterly. Therefore, the alternate is in accordance with OM-10, Para. 4.2.1.

Item Number	Valve Identification	Justification for Deferring Valve Exercising	Proposed Alternate Testing	Evaluation of Licensee's Justification
J3	HPSI pump discharge check valves: SI-102, -108, and -115	These valves cannot be full-stroke or partial-stroke exercised open during plant operation, quarterly or during cold shutdowns, since to do so would require a flow path to the RCS. That flow path cannot be utilized during power operation because the HPSI pumps do not develop sufficient discharge pressure to overcome RCS pressure. This same flow path cannot be utilized during cold shutdowns because there is insufficient volume in the RCS to accommodate the flow required, and a low-temperature overpressure condition of the RCS could result. Additionally, these valves cannot be exercised during quarterly pump tests or miniflow because the minimum flow lines branch off upstream of the check valves and no flow occurs through these valves.	Valves will be full-stroke exercised open during refueling outages when the reactor vessel head is removed. This will provide an expansion volume to accommodate the flow required.	Full-stroke exercising these valves open quarterly or during cold shutdowns is impractical. Therefore, the alternate is in accordance with OM-10, Para. 4.3.2.
J4	LPSI pump discharge check valves: SI-121 and -129	These valves cannot be partial-stroke or full-stroke exercised in the open direction quarterly during power operation because there is no flow path available except during shutdown cooling. Additionally, these valves cannot be exercised open during quarterly pump tests or using the miniflow line because the minimum flow lines branch off upstream of the check valves and no flow occurs through these valves.	Valves will be full-stroke exercised open during cold shutdown.	Exercising these valves open quarterly is impractical. Therefore, the alternate is in accordance with OM-10, Para. 4.3.2.
J5	Charging pump boric acid supply check valve: CH-143 Charging pump boric acid gravity feed check valve: CH-155 Charging pump safety injection and refueling water tank (SIRWT) suction check valve: CH-156	These check valves serve to permit direct feed of concentrated boric acid solution to the charging pump suction header. These check valves cannot be full-stroke or partial-stroke exercised quarterly during power operation or cold shutdown. The only flow path through these valves is into the RCS; exercising would result in injecting highly concentrated boric acid into the RCS. Injecting concentrated boric acid into the RCS during power operation could cause a reactivity excursion or a plant shutdown. Injecting concentrated boric acid into the RCS during cold shutdown could delay reactor startup because of the requirement to establish the proper boron concentration prior to the reactor startup.	Valves will be full-stroke exercised open during refueling outages.	Exercising these valves open quarterly is impractical, therefore, deferring exercising until cold shutdowns is in accordance with OM-10, Para. 4.3.2. However, J5 does not adequately demonstrate the impracticality of at least part-stroke exercising these valves when borating the RCS while going into cold shutdowns (see Appendix A, Item 7).

Item Number	Valve Identification	Justification for Deferring Valve Exercising	Proposed Alternate Testing	Evaluation of Licensee's Justification
J6	Steam generator normal feedwater inlet check valves: FW-161 and -162	These check valves function to prevent the loss of inventory of the steam generators in the event of a line break upstream between valves HCV-1386 (HCV-1385) and check valve FW-161 (FW-162). These check valves cannot be full-stroke exercised closed quarterly during power operation because the only flow paths are into the steam generators. During power operation, the feedwater paths to the steam generators must not be isolated as this would remove the "heat sink" for the RCS.	Valves will be full-stroke exercised closed during cold shutdown as defined in the FCS TS, provided the feedwater system is able to be isolated from the steam generator and the feedwater lines are able to be drained as required to permit testing.	Exercising these valves closed quarterly is impractical. Therefore, the alternate is in accordance with OM-10, Para. 4.3.2. (See Appendix A, Item 9)
J7	Steam generator auxiliary feedwater injection check valves: FW-163 and -164	These check valves open for auxiliary feedwater flow to the steam generators. Exercising these valves during power operation would result in cold water injection to a portion of the steam generators normally at 400 to 500°F, which would cause unnecessary and possibly damaging thermal stresses in the steam generators.	These check valves are exercised open during cold shutdown. Since failure of these valves to function in the reverse flow direction would not interfere with the plant's ability to shutdown or to mitigate the consequences of an accident, these check valves shall be full-stroke exercised only in the open direction.	Exercising these valves closed quarterly is impractical. Therefore, the alternate is in accordance with OM-10, Para. 4.3.2. (See Appendix A, Item 10)
J8	Reactor vessel head and pressurizer vent valves: HCV-176, -177, -178, -179, -180, and -181	These valves are intended to be used to vent the reactor pressure vessel head and pressurizer. These valves are Target Rock solenoid valves, which have a history of sticking open when exercised. This could result in a small break LOCA if these valves are stroke-timed at power or at cold shutdown. Therefore, partial or full-stroke timing during normal operation or cold shutdown is impractical.	These valves will be stroke-timed in the open and closed directions during refueling outages.	Exercising these valves quarterly is impractical, therefore, deferring exercising until cold shutdowns is in accordance with OM-10, Para. 4.2.1. However, the DTJ does not adequately demonstrate the impracticality of exercising these valves during cold shutdowns (see Appendix A, Item 7).
J9	Shutdown cooling injection check valves: SI-194, -197, -200, and -203	These check valves cannot be full-stroke exercised open or partial-stroke exercised quarterly during power operation because no flow path is available at operating pressure due to system configuration. Since the SI pumps are not able to develop sufficient discharge pressure to overcome RCS pressure, the valves are not able to be exercised. Valves SI-194, -197, -200 and -203 are pressure isolation valves as defined by NRC GL 89-04 and as listed in the FCS TS.	These check valves are full-stroke exercised open during cold shutdown when the shutdown cooling system is in service. These check valves will be leak tested during cold shutdown in accordance with the requirements of FCS TS 2.1, Table 2-9, and Item 14 of the table format of the FCS Program Plan.	Exercising these valves open quarterly is impractical. Therefore, the alternate is in accordance with OM-10, Para. 4.3.2.

Item Number	Valve Identification	Justification for Deferring Valve Exercising	Proposed Alternate Testing	Evaluation of Licensee's Justification
J10	HPSI to reactor coolant loop check valves: SI-195, -198, -201, and -204	These check valves cannot be full-stroke or partial-stroke exercised open quarterly during power operation because the only flow path available is into the RCS. Since the HPSI pumps do not develop sufficient discharge pressure to overcome RCS operating pressure, the valves cannot be exercised during cold shutdown because the RCS does not contain an adequate expansion volume and a low temperature overpressurization of the RCS could result. Valves SI-195, -198, -201 and -204 are pressure isolation valves (PIVs) as defined by NRC GL 89-04 and as listed in the FCS TS.	These check valves will be full-stroke exercised open during refueling outages when the RCS is depressurized and the reactor vessel head is removed in order to provide an expansion volume to accommodate the flow required. These check valves will be leak tested during cold shutdown in accordance with the requirements of FCS TS 2.1, Table 2-9, and Item 14 of the table format of the FCS Program Plan.	Full-stroke exercising these valves open quarterly or during cold shutdowns is impractical. Therefore, the alternate is in accordance with OM-10, Para. 4.3.2.
J11	HPSI to reactor coolant loop check valves: SI-196, -199, -202, -205, -343 and CH-469	These valves function to prevent backflow through the SI pump discharge headers. These valves cannot be full-stroke or partial-stroke exercised open during power operation utilizing flow because the HPSI pumps do not develop sufficient discharge pressure to overcome RCS pressure. The charging pumps cannot be used during power operation because the flow path from the pumps would bypass the regenerative heat exchanger and result in injecting cold water, causing thermal shock to the injection nozzles and a reactivity transient. Check valve SI-343 cannot be partial-stroke exercised during cold shutdowns because using the HPSI pumps could cause an overpressurization of the RCS; the HPSI pumps are therefore tagged out to prevent inadvertent operation.	Check valve CH-469 will be partial-stroke exercised open during cold shutdown using the charging pumps. Both check valves CH-469 and SI-343 will be full-stroke exercised open during refueling outages using the charging pumps and the HPSI pumps as necessary.	It is impractical to full or part-stroke exercise these valves open quarterly. J11 does not provide a basis for not full-stroke exercising valves SI-196, -199, -202 and -205 at cold shutdowns nor are these valves addressed in the Alternate Testing. In addition, J11 does not provide a basis for not full-stroke exercising valve CH-469 quarterly or at cold shutdowns. All of these valves should be tested as justified in accordance with OM-10, Para. 4.3.2. (See Appendix A, Items 7 and 11).
J12	Charging pump discharge to RCS check valves: CH-198, -203, and -204	These check valves cannot be full-stroke exercised open during plant operations quarterly or during cold shutdowns, since to do so would require the charging and HPSI pumps to be run which would require a flow path to the RCS. That flow path cannot be utilized during power operation because the HPSI pumps do not develop sufficient discharge pressure to overcome RCS pressure. This same flow path cannot be utilized during cold shutdowns because there is insufficient volume in the RCS to accommodate the flow required and a low-temperature overpressure condition of the RCS could result.	The check valves will be partial-stroke exercised in the open direction quarterly during power operation using the charging pumps. The check valves will be full-stroke exercised in the open direction during refueling outages when the reactor vessel head is removed, using the charging pumps and the HPSI pumps.	Full-stroke exercising these valves open quarterly or during cold shutdowns is impractical. Therefore, the alternate is in accordance with OM-10, Para. 4.3.2.

Item Number	Valve Identification	Justification for Deferring Valve Exercising	Proposed Alternate Testing	Evaluation of Licensee's Justification
J13	Letdown temperature control and isolation valves: TCV-202 and HCV-204	These valves are used for RCS Loop 2A, letdown isolation and temperature regulation. Stroking these valves quarterly during power operation could result in the termination of letdown flow. This would isolate the RCS purification process and could potentially cause a reactivity excursion. These valves cannot be partial-stroked because the valves are either fully open or fully closed.	These valves will be stroke-timed in the closed direction during cold shutdown when the RCS is depressurized.	Exercising these valves closed quarterly is impractical. Therefore, the alternate is in accordance with OM-10, Para. 4.2.1. (See Appendix A, Item 9)
J14	Auxiliary pressurizer spray check valve: CH-205	This check valve cannot be full-stroke exercised during plant operations quarterly or during cold shutdowns, since to do so would require a flow path to the RCS. That flow path cannot be utilized during power operation because the HPSI pumps do not develop sufficient discharge pressure to overcome RCS pressure. This same flow path cannot be utilized during cold shutdowns because there is insufficient volume in the RCS to accommodate the flow required and a low temperature overpressure condition of the RCS could result.	The check valves will be partial-stroke exercised in the open direction quarterly during power operation using the charging pumps. The check valves will be full-stroke exercised in the open direction during refueling outages when the reactor vessel head is removed, using the charging pumps and the HPSI pumps.	Full-stroke exercising this valve open quarterly or during cold shutdowns is impractical. Therefore, the alternate is in accordance with OM-10, Para. 4.3.2.
J15	RCP control bleedoff isolation valves: HCV-206 and -241	The Reactor Coolant Pump (RCP) seals serve as an RCS pressure boundary; therefore, seal failure could result in unisolable coolant leakage from the RCS. Isolation of the RCP seal bleed-off by stroking these valves closed would cause the seal bleed-off line relief valve (CH-208) to lift, directing reactor coolant directly to the reactor coolant drain tank (RCDT). If the leakage remained unchecked, the RCDT relief valve could lift directing reactor coolant to the containment floor, causing a ventilation isolation actuation signal (VIAS). Additionally, the temporary isolation of pump seal flow (until the relief valve lifted) would eliminate the ability of the RCP seal to break down RCS pressure and could potentially cause localized overheating of the seals. The pump seals can be damaged by overheating if seal water flow is stopped while the pumps are running. It is impractical to exercise these valves quarterly or during any plant conditions that could result in abnormal seal wear. This could lead to failure of the RCP seals, creating unisolable leakage equivalent to a small break LOCA.	The valves will be stroke-timed in the closed direction during cold shutdown, when the RCS is depressurized and the RCPs are secured.	Exercising these valves closed quarterly is impractical. Therefore, the alternate is in accordance with OM-10, Para. 4.2.1.

Item Number	Valve Identification	Justification for Deferring Valve Exercising	Proposed Alternate Testing	Evaluation of Licensee's Justification
J16	Volume control tank (VCT) and safety injection and refueling water tank (SIRWT) outlet isolation valves: LCV-218-2 and -218-3	These valves function to provide VCT level control and switch charging suction to the SIRWT. The valves cannot be stroke-tested quarterly because doing so would terminate charging flow to the RCS and would have the potential for disrupting pressurizer level regulation or boron concentration regulation. Pressurizer level regulation disruption can lead to RCS pressure transients and disruption of boron concentration could cause reactivity excursions.	Valve LCV-218-2 will be stroke-timed in the closed direction and valve LCV-218-3 will be stroke-timed in the open direction during cold shutdowns.	Exercising these valves quarterly is impractical. Therefore, the alternate is in accordance with OM-10, Para. 4.3.2.
J17	Auxiliary pressurizer spray isolation valves and the instrument air accumulator check valve: HCV-240, -249, and IA-HCV-240-C	Valves HCV-240 and -249 cannot be stroke-timed quarterly during power operation because doing so will lead to large scale depressurization of the RCS and thermal shock of the pressurizer spray nozzle. The IA accumulator check valve (IA-HCV-240-C) cannot be full-stroke exercised in the open direction quarterly during power operation, as exercising of the check valve will cause HCV-240 to cycle. This could cause large scale depressurization of the RCS and thermal shock of the pressurizer spray nozzle. Check valve IA-HCV-240-C cannot be partial-stroke exercised for the same reason.	Valve IA-HCV-240-C will be exercised in the open and closed directions during cold shutdowns. Valves HCV-240 and HCV-249 will be stroke-timed in both the open and close directions during cold shutdowns.	Exercising these valves quarterly is impractical. Therefore, the alternate is in accordance with OM-10, Paras. 4.2.1 and 4.3.2.
J18	Concentrated boric acid to charging pump suction isolation valve: HCV-268	This valve serves to isolate concentrated boric acid from the charging pump suction header. This valve cannot be stroke-timed quarterly during power operation because doing so would allow concentrated boric acid solution to be injected into the RCS. Boration of the primary system during normal power operation would cause reactivity transients and possibly result in a plant shutdown. This valve cannot be partial-stroked for the same reason.	Valve will be stroke-timed in the open direction during cold shutdown.	Exercising this valve quarterly is impractical. Therefore, the alternate is in accordance with OM-10, Para. 4.2.1.

Item Number	Valve Identification	Justification for Deferring Valve Exercising	Proposed Alternate Testing	Evaluation of Licensee's Justification
J19	Charging pump discharge to HPSI isolation valves: HCV-308 and -2988	These valves provide an alternate charging flow path into the HPSI header and an alternate source for long term core cooling. They cannot be stroke-timed quarterly during power operation because a charging pump is continuously operating during power operation. Opening one of these valves would expose the HPSI header to charging pressure at a time when this is not a desired charging flow path. It is impractical to shut down the charging flow to perform this test because of the thermal and flow transients that would result.	Valve HCV-2988 will be stroke-tested both in the open and closed directions during cold shutdown. HCV-308 will be stroke-tested in the open direction only, during cold shutdown.	J19 does not adequately demonstrate the impracticality of exercising these valves quarterly (see Appendix A, Item 7).
J20	HPSI header check valve: SI-323	This check valve functions to prevent backflow of charging flow to the lower design pressure HPSI piping when the alternate charging flow path is active. The only flow path available is into the RCS and since the HPSI pumps do not develop sufficient discharge pressure to overcome RCS operating pressure, this valve cannot be exercised quarterly during power operation. This valve cannot be exercised during cold shutdowns because the RCS does not contain an adequate expansion volume and a low-temperature overpressurization of the RCS could result. Additionally, this valve cannot be part-stroke exercised during pump test or miniflow because the minimum flow lines branch off upstream of the check valve and no flow occurs through this valve.	This check valve will be exercised full open and full closed during refueling outages.	Exercising this valve open quarterly or during cold shutdowns is impractical. Therefore, the alternate is in accordance with OM-10, Para. 4.3.2.
J21	CS header isolation valves and instrument air accumulator check valve: HCV-344, -345, and IA-HCV-344-C	Valves HCV-344 and -345 serve as CS isolation. These valves cannot be stroke-tested quarterly during power operation since the potential for spraying down the containment is increased. These valves represent the only boundary between the CS and safety injection pump headers and the CS nozzles when manual valves SI-177 and SI-178 are open. The valves cannot be part-stroked for the same reason. Valve IA-HCV-344-C is the IA accumulator check valve for process valve HCV-344, and functions to allow the valve to be closed on loss of IA, if required. This check valve cannot be exercised quarterly as required as this would stroke the process valve, HCV-344.	Valve HCV-344 shall be stroke-timed in both the open and closed direction during cold shutdown. HCV-345 shall be stroke-timed in the open direction during cold shutdown. The IA check valve IA-HCV-344-C shall be exercised in the closed direction during cold shutdown.	J21 does not adequately demonstrate the impracticality of exercising these valves quarterly (see Appendix A, Item 7).

Item Number	Valve Identification	Justification for Deferring Valve Exercising	Proposed Alternate Testing	Evaluation of Licensee's Justification
J22	Shutdown cooling from RCS isolation valves: HCV-347 and -348	These valves cannot be quarterly stroke-timed closed during power operation because they are interlocked closed to ensure the integrity of the pressure boundary between Class 2501 and Class 301 piping when the RCS pressure is >250 psia.	These valves will be stroke-timed in the close direction during cold shutdown prior to initiating shutdown cooling (<300°F and <250 psi) while the steam generator is still available for removing decay heat from the primary.	Exercising these valves open quarterly is impractical. Therefore, the alternate is in accordance with OM-10, Para. 4.2.1.
J23	SI tank leakage coolers inlet and outlet isolation valves: HCV-425A, -425B, -425C, and -425D	These valves serve to isolate containment penetrations M-39 and M-53, component cooling system penetrations. They cannot be stroke-timed closed quarterly during power operation because failure of these valves in the closed position would terminate cooling flow to safety injection tank leakage coolers. This would have the potential for lifting the relief valve (SI-222) to the RCDT which could eventually cause reactor coolant to overflow to the containment floor, causing a ventilation isolation actuation signal. These valves cannot be part-stroked because they are either fully opened or fully closed.	These valves will be stroke-timed in the close direction during cold shutdowns.	Exercising these valves closed quarterly is impractical. Therefore, the alternate is in accordance with OM-10, Para. 4.2.1.
J24	RCP cooler isolation valves and associated instrument air supply check valves: HCV-438A, -438B, -438C, -438D, IA-HCV-438B-C and -438D-C	These valves serve to isolate containment penetrations M-18 and M-19, RCP seal cooling water. Exercising these valves would isolate cooling water flow to the RCPs which could damage the pumps if they are operating. RCP failure during power operation could result in a plant shutdown. Therefore, it is not practical to exercise these valves quarterly during power operations. During some cold shutdowns, RCS temperature may be held above 130°F and plant conditions may not allow further cooldown or stopping all RCPs. Exercising these valves during cold shutdowns when RCS temperature is greater than 130°F or when any RCP is running could result in RCP damage. Therefore, it is not practical to exercise these valves when those plant conditions exist. These valves cannot be part-stroked because they are either fully open or fully closed. The IA accumulator check valves cannot be exercised quarterly during power operation as exercising these valves will cause cycling of the process valves.	Valves HCV-438A, -438B, -438C and -438D will be stroke-timed in both the open and close direction during cold shutdown, provided the RCS is depressurized, RCS temperature is less than 130°F, and RCPs are secured. IA accumulator check valves IA-HCV-438B-C and -438D-C will be exercised closed during cold shutdown, provided the RCS is depressurized, RCS temperature is less than 130°F and the RCPs are secured.	Exercising these valves closed quarterly is impractical. Therefore, the alternate is in accordance with OM-10, Paras. 4.2.1 and 4.3.2.

Item Number	Valve Identification	Justification for Deferring Valve Exercising	Proposed Alternate Testing	Evaluation of Licensee's Justification
J25	Nuclear detector well cooling units cooling water isolation valves: HCV-467A, -467B, -467C, and -467D	These valves serve to isolate containment penetrations M-15 and M-11, component cooling water (CCW) penetrations. These valves cannot be stroke-timed quarterly during power operation because failure of these valves during testing would render the nuclear detector well cooling units inoperable. This would cause the nuclear instrumentation to have erratic indication. Should the nuclear detector well cooling units fail, the LCO specified in TS 2.13 would be entered and could result in a plant shutdown. These valves cannot be partial-stroked because they are either fully opened or fully closed.	These valves shall be stroke-timed in the close direction during cold shutdown.	Exercising these valves closed quarterly is impractical. Therefore, the alternate is in accordance with OM-10, Para. 4.2.1. (See Appendix A, Item 8)
J26	Main steam isolation stop check valves: HCV-1041A and -1042A	These valves serve to isolate the main steam headers. They cannot be tested quarterly during power operation because doing so would isolate steam flow in the steam generators and result in a turbine and reactor trip. These valves cannot be part-stroked because they are either fully opened or fully closed.	These valves will be stroke-timed in the closed direction during cold shutdown.	Exercising these valves closed quarterly is impractical. Therefore, the alternate is in accordance with OM-10, Para. 4.2.1.
J27	Main steam isolation bypass valves: HCV-1041C and -1042C	These valves serve to provide a pathway from the steam generators to the steam dump and bypass valves in the event that the main steam isolation valves (MSIV) close. Stroke-timing these valves quarterly during power operation is not acceptable because the valves are interlocked closed when the MSIVs are open. Bypassing this interlock could cause the MSIVs to close, causing the turbine to trip and resulting in a reactor trip. The valves cannot be part-stroked for the same reason.	These valves will be stroke-timed in the closed direction during cold shutdown.	Exercising these valves open quarterly is impractical. Therefore, the alternate is in accordance with OM-10, Para. 4.2.1.
J28	Main feedwater isolation valves: HCV-1385 and -1386	Valves HCV-1385 and -1386 cannot be stroke-timed quarterly during power operation because doing so would isolate feedwater to steam generators resulting in a reactor trip. These valves cannot be part-stroked because they are either fully opened or fully closed.	These valves will be stroke-timed in the closed direction during cold shutdown.	Exercising these valves closed quarterly is impractical. Therefore, the alternate is in accordance with OM-10, Para. 4.2.1.
J29	Steam generator blowdown isolation valves: HCV-1387A, -1387B, -1388A, and -1388B	These valves cannot be quarterly stroke-timed during power operation because doing so would terminate the steam generator blowdown and disrupt all volatile chemistry control. They cannot be partial-stroked because they are either fully opened or fully closed.	These valves will be stroke-timed in the closed direction during cold shutdowns.	Exercising these valves closed quarterly is impractical. Therefore, the alternate is in accordance with OM-10, Para. 4.2.1. (See Appendix A, Item 7)

Item Number	Valve Identification	Justification for Deferring Valve Exercising	Proposed Alternate Testing	Evaluation of Licensee's Justification
J30	Instrument air CIVs: PCV-1849A and -1849B	These valves serve to isolate IA pressure to containment systems. PCV-1849A (inboard) and -1849B (outboard) were added during the refueling and maintenance outage (Fuel Cycle 12) in 1988. Stroke-timing cannot be performed quarterly during power operations or cold shutdown with RCS temperature greater than 130°F and the RCS not depressurized. The valves cannot be part-stroked, because they are either fully opened or fully closed. Closing these valves could: (1) cause fluctuations in the pressure control of the pressurizer (PCV-103-1, PCV-103-2), (2) result in damage to RCP seals (HCV 241), (3) disrupt RCS letdown to CVCS (TCV 202, LCV-101-1, LCV-101-2), (4) damage the nuclear detector instrumentation (HCV-467A/C), (5) cause level fluctuation in the SIT (HCV-2916, HCV-2936, HCV-2955, HCV-2976), and (6) cause loss of steam generator blowdown (HCV-1387A and HCV-1388A). The ripple effect caused by the exercise stroking of PCV-1849A/B would be detrimental during power operation or when in cold shutdown with RCS temperature greater than 130°F and not depressurized.	These valves will be stroke-timed in the closed direction during cold shutdown when the RCS temperature is less than 130°F with RCPs off and the RCS depressurized.	Exercising these valves closed quarterly and during each cold shutdown is impractical. Therefore, the alternate is in accordance with OM-10, Para. 4.2.1.
J31	Steam generator blowdown sample isolation valves: HCV-2506A, -2506B, -2507A, and -2507B	These valves serve to isolate the steam generator blowdown sampling lines. These valves cannot be stroke-timed quarterly during power operation because doing so would terminate blowdown sample line flow. The steam generator blowdown activity monitor is on the sample line. TS 2.9(1)e requires that blowdown activity shall be continuously monitored by the steam generator blowdown sample monitoring system when blowdown is occurring. Steam generator blowdown is a continuous function at the FCS. Part-stroking cannot be performed since these valves are either fully opened or fully closed.	These valves will be stroke-timed in the closed direction during cold shutdown.	Exercising these valves closed quarterly is impractical. Therefore, the alternate is in accordance with OM-10, Para. 4.2.1.

Item Number	Valve Identification	Justification for Deferring Valve Exercising	Proposed Alternate Testing	Evaluation of Licensee's Justification
J32	HPSI alternate header isolation valve and its instrument air accumulator check valve: HCV-2987 and IA-HCV-2987-C	Valve HCV-2987 closes to provide a long term core cooling flow path. It cannot be stroke-timed quarterly during power operation because failure in a non-conservative position would block one of the safety injection flow paths. This could cause the plant to enter into an LCO and cause undue cycling of plant equipment. The IA accumulator check valve cannot be exercised quarterly during power operation as exercising of this check valve will cause cycling of the process valve.	Valve HCV-2987 will be stroke-timed both in the open and closed directions during cold shutdowns. The IA accumulator check valve will be exercised in the open and closed directions during cold shutdown.	J32 does not adequately demonstrate the impracticality of exercising these valves quarterly (see Appendix A, Item C).
J33	Instrument air supply check valves: IA-HCV-238-C and -239-C	These are check valves on IA accumulators attached to HCV-238 and -239, which are located inside containment. The process valves are remotely stroke-tested in both the open and closed directions quarterly, but due to inaccessibility during power operation, the check valves are not able to be tested.	These check valves will be exercised in the open and closed directions at cold shutdown.	Exercising these valves quarterly is impractical. Therefore, the alternate is in accordance with OM-10, Para. 4.3.2.
J34	Instrument air supply check valves: IA-HCV-285-C and -286-C	These are check valves on IA accumulators attached to HCV-385 and -386 (safety injection mini flow bypass isolation valves). The process valves are remotely stroke-tested quarterly. The test methodology for the IA accumulator check valves requires the process valves to be closed greater than one hour each. This isolates the SI miniflow recirculation line, which, if the SI pumps start, could cause these pumps to operate at shutoff head. Therefore, the check valves are not able to be tested quarterly. Running the SI pumps at shutoff head could cause the pumps to overheat and cavitate. Prolonged closure of these valves could cause equipment damage.	These valves will be full-stroke exercised in the open and closed directions at cold shutdown.	Exercising these valves quarterly is impractical. Therefore, the alternate is in accordance with OM-10, Para. 4.3.2.

Item Number	Valve Identification	Justification for Deferring Valve Exercising	Proposed Alternate Testing	Evaluation of Licensee's Justification
J35	VCT outlet check valve: CH-166	This check valve serves to prevent a divergent path from the boric acid injection system to the VCT. A divergent path may reduce the concentration of boric acid required to be injected into the RCS. This check valve cannot be full-stroke exercised in the closed direction quarterly during power operation or cold shutdown. The only flow path through this valve is to the RCS, and would result in injecting highly concentrated boric acid into the RCS. Injecting concentrated boric acid into the RCS during cold shutdown could delay reactor startup because of the requirement to establish the proper boron concentration prior to reactor startup. The check valve cannot be partial-stroke exercised closed during power operation or cold shutdowns for the same reasons.	Valve will be full-stroke exercised in the closed direction during refueling outages.	It is impractical to exercise this valve quarterly, therefore, deferring exercising until cold shutdowns is in accordance with OM-10, Para. 4.3.2. However, J35 does not adequately demonstrate the impracticality of exercising this valve when borating the RCS while going into cold shutdowns (see Appendix A, Item 7).
J36	CS pump discharge check valves: SI-135, -143, and -149	These valves cannot be full-stroke exercised open quarterly during power operation because the only full flow path is into the CS headers. This would result in spraying down of the equipment in containment, possibly causing equipment damage and requiring extensive cleanup. Also, these valves cannot be part-stroke exercised during quarterly CS pump tests because the minimum flow lines branch off upstream of the check valves and therefore no flow occurs through these valves. Using the discharge tap downstream of the minimum flow lines will overflow the floor drains in the auxiliary building potentially creating an increase in radioactive contamination and background radiation levels.	Valves will be full-stroke exercised in the open direction during cold shutdown when the CS pumps are able to be aligned for shutdown cooling to the shutdown cooling heat exchangers (< 120°F primary temperature) in accordance with the FCS TS.	Exercising these valves quarterly or during each cold shutdown is impractical. Therefore, the alternate is in accordance with OM-10, Para. 4.3.2.
J37	SI and CS pump bearing coolers CCW isolation valve: HCV-474	This valve serves to isolate CCW from the SI and CS pump bearing coolers. This valve cannot be quarterly stroke-timed during power operation because failure of this valve in a non-conservative position would render the SI and CS pumps inoperable. Should the CCW to bearing coolers fail, the LCO in TS 2.01 would be entered and could result in a forced plant shutdown. This valve cannot be partial stroked because it is either fully open or fully closed.	Valve HCV-474 shall be stroke-timed in the open direction during cold shutdown.	Exercising these valves quarterly is impractical. Therefore, the alternate is in accordance with OM-10, Para. 4.2.1. (See Appendix A, Item 8)

Item Number	Valve Identification	Justification for Deferring Valve Exercising	Proposed Alternate Testing	Evaluation of Licensee's Justification
J38	These check valves are instrument air supply header check valves for the control room HVAC dampers: IA-PCV -668OA-1-C, -668OA-2-C, -668OB-1-C, -668OB-2-C, and IA-PCV-6682-C	These valves cannot be exercised quarterly during power operation, as exercising these valves will cause isolation of the control room (CR) air filtration dampers. Failure of the CR air filtration dampers in a non-conservative position would cause the CR filtration system to be inoperable. This would require the plant to be in cold shutdown per TS 2.12. Failure of the dampers in the open position would not allow the CR to be isolated during a toxic gas release. This would result in entry into TS 2.01.	Check valves will be full flow exercised in the closed direction during cold shutdown.	Exercising these valves quarterly is impractical. Therefore, the alternate is in accordance with OM-10, Para. 4.3.2.
J39	Main steam stop check (reverse flow) valves: HCV-1041B and -1042B	These valves cannot be exercised quarterly during power operation because doing so would cause steam to be isolated to the main steam header, causing the turbine to trip and resulting in a reactor trip. It is impractical to reverse flow test these valves during cold shutdown; to do so would require the downstream side of the valves to have reverse flow sufficient to close the 600 pound, 28 inch disks. To close these disks would require extensive modifications to the secondary side of the main steam system to permit sufficient DP to close the valve disks. Another method would be to fill the downstream side of the valve disks with fluid. To do this would require extensive piping and support modifications because of excessive loading on the main steam piping. To perform any type of successful reverse flow test on these check valves would require extensive plant modifications and manpower, and would subject the main steam system to potentially detrimental conditions, without providing a commensurate increase in public safety or check valve reliability.	Valves HCV-1041B and -1042B will be alternately disassembled and inspected one each refueling outage. Sample disassembly of these check valves is in accordance with O&M Part 10 and the NRC guidelines established in Generic Letter 89-04, Attachment 1, Position 2. For an 18-month refueling cycle, this method of sample disassembly and inspection ensures that each check valve is disassembled and inspected at least once every three years.	It is impractical to verify closure of these valves quarterly or during cold shutdowns. The proposed test method is in accordance with OM-10, Para. 4.3.2.4. The alternate test frequency is approved by GL 89-04 provided that the testing complies with all of the provisions of GL 89-04, Attachment 1, Position 2.

APPENDIX A

IST PROGRAM ANOMALIES

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IST PROGRAM ANOMALIES

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. Pump Request E3 requests relief from the flow rate acceptance criteria for the charging pumps and proposes to not have an Alert Range for these pumps and to set the Required Action Range at <35 gpm and >40 gpm (refer to Section 2.2.1.1 of this report). The proposed Required Action Ranges do not differ significantly from the Code ranges, however, the proposed Acceptable and Alert Ranges are non-conservative in comparison with the Code requirements. The licensee's justification supporting this deviation from the Code is that there is no minimum flow rate mentioned in the USAR for the charging pumps. However, the criteria of Table 3 are not based on specified system operational requirements, they are based on an amount of pump degradation that causes concern about continued pump operational readiness. These limits should not be ignored unless it can be shown that they may not be indicative of pump degradation that could increase the likelihood of the pump not being capable of performing its safety function. Therefore, we recommend that relief be denied.

3. Valve relief requests E1, E2, and E3 deal with sample disassembly of check valves (refer to Sections 3.2.1.1, 3.2.2.1, and 3.3.1.1 of this report). OM-10 permits the use of disassembly of check valves to verify obturator movement as an alternative to exercising with flow or a mechanical exerciser. However, when using this method, OM-10 requires disassembly of each valve every refueling outage. GL 89-04, Position 2, permits the use of a sampling program for identical valves in similar applications. GL 89-04 also provides a mechanism for extending the valve disassembly interval in cases of extreme hardship. The licensee's basis supports extending the disassembly interval based on the low failure rate of these specific valves and similar valves in the nuclear industry. However, the criteria for extending the interval in GL 89-04 requires the licensee to disassemble and inspect each valve in the group and to document in detail the valve condition and its capability of being full-stroke exercised. The request indicated that each valve had been disassembled and found to be "like new." Stating that a valve is "like new" may be a subjective evaluation unless supported by a quantitative assessment such as

taking critical dimension measurements and comparing them with new valve baseline measurement data. The GL 89-04 interval extension criteria do not provide specific evaluation requirements (e.g., trending critical dimension measurements), however, the licensee's evaluation should be adequate to provide reasonable assurance that degradation is not occurring in the group valves at a rate that could result in a valve becoming incapable of performing its function prior to the next examination. The GL 89-04 interval extension criteria also require a review of the installation of each valve addressing the "EPRI Applications Guidelines for Check Valves in Nuclear Power Plants." It is not clear from the relief request that this review has been performed and that the installation of these valves is satisfactory from that respect.

Disassembly and inspection is permitted by OM-10 and relief is granted to perform it on a sampling basis by GL 89-04, therefore, these valves may be disassembled and inspected every refueling outage on a sampling basis provided that it is performed in accordance with all of the provisions of GL 89-04. In addition, the disassembly interval may be extended if all of the interval extension criteria of GL 89-04, Position 2, are met.

Relief is not granted for the above relief requests for testing that deviates from that prescribed in GL 89-04, Position 2, unless the request specifically identifies otherwise. 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 other than indicated in the current relief request, a revised relief request must be submitted for review and approval prior to implementing the testing.

Some test method may be feasible to verify the full-stroke open capability of the affected valves in lieu of disassembly and inspection. The licensee should consider methods such as using non-intrusive techniques (e.g., acoustics, ultrasonics, magnetics, radiography, or thermography) to verify a full-stroke of these check valves. 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.

4. In valve relief requests E2 and E3 (refer to Sections 3.2.1.1 and 3.2.2.1 of this report), the licensee states "the sample disassembly of these check valves is in accordance with the NRC guidelines established in Generic Letter 89-04, Attachment 1, Position 2 with the exception of partial-stroking." Position 2 states that "if possible, partial valve stroking quarterly or during cold shutdowns, or after reassembly must be performed." Not performing part-stroke exercising in accordance with Paras. 4.2.1.2(b) and (d) is acceptable if the licensee identifies the technical basis that makes this testing impractical. However, the part-stroke exercise after reassembly required by Position 2 is to demonstrate that valve disassembly and reassembly has been performed in a manner that has not rendered the valve incapable of performing its function. This testing is to meet the post maintenance testing requirements of Para. 3.4. Not performing post maintenance testing to verify proper reassembly of these valves following their disassembly and inspection is unacceptable. If a part-stroke exercise following reassembly is impractical, this should be identified in the program and an alternate proposed that offers reasonable assurance of the valve's operational readiness following the maintenance procedure. The

OM-10, Para. 3.4, must be met for the disassembly and inspection activity unless specific relief is requested and approved.

5. Valve Request G1 requests relief from the scope of OM-1 for thermal relief valves on safety-related systems and proposes to control the testing of these valves under the preventive maintenance program (refer to Section 3.1.1.1 of this report). In the 1986 edition of Section XI, the Code committee increased the scope of the valves subject to IST to include those valves which protect certain Code-Class safety-related systems from overpressure. Thermal relief valves installed to protect portions of safety-related systems against overpressure may be included in this expanded scope. The relief valves that may be involved are those that meet the following criteria: a) they protect a portion of a safety-related system, b) the protected piping and/or component may be isolated during a plant operating mode where credit is taken for operation of the safety-related system, c) the protected section is subject to a mechanism that could overpressurize it when isolated, and d) the integrity of the protected section (e.g., the absence of a rupture or stuck open relief valve) is required for the system to meet its safety function. Because some of the thermal relief valves at Fort Calhoun Station may be included in the expanded scope as discussed above, we recommend that general relief not be granted as requested for all thermal relief valves. The licensee should justify exclusion of those thermal relief valves that do not protect portions of safety systems that may be isolated during a plant operating mode where credit is taken for operation of the safety-related system. Relief valves that protect portions of safety-related systems that may be isolated during a plant operating mode where credit is taken for operation of the system should be included in the IST program and tested to the Code requirements.

6. Valve request E6 requests relief from the test frequency requirements of OM-1 for the auxiliary feedwater pump oil cooler relief valve and proposes to test this valve every third refueling outage (refer to Section 3.4.1.1 of this report). Valve FW-1525 is the only one of its type and manufacturer, therefore, it forms a one valve sample group. OM-1 requires a minimum of 20% of the valves of each type and manufacturer be tested within any 48 months. The current refueling outage frequency is 18 months, therefore, the minimum time between three refueling outages would be 54 months. The 54 month period is not significantly longer than the 48 month period, therefore, this extension may be acceptable depending on the failure and repair record of this valve.

   Discussions with members of the Working Group on Safety and Relief Valves (OM-1) indicate that the working group did not consider one valve groups when writing the Code. It is the impression of the working group members contacted, that the working group's intent is to have this type of valve tested at least once every ten years. The working group will meet on June 20 and 21, 1994, and will include this issue on their agenda. We recommend that the alternative be authorized pursuant to 10 CFR 50.55a(a)(3)(i) until the OM-1 Working Group clarifies this issue. After the working group has clarified their position on this issue, the licensee should either modify or delete relief request E6.

7. Several of the Deferred Test Justifications do not adequately demonstrate the impracticality of testing the subject valves quarterly during power operation or during cold shutdowns (if testing is deferred until refueling outages). OM-10, Paragraphs 4.2.1.2 and

Paragraph 6.2(d), requires the owner to include the justifications for these deferrals in their test plans. These justifications should provide technical bases that show why testing more frequently is impracticable. These bases should explain the negative consequences that may result if the valve is tested during power operation or during cold shutdowns (if applicable). Examples of negative consequences of testing that adequately demonstrate impracticality are that the testing could cause equipment damage, represent a safety hazard to test personnel, or result in a significant power reduction or plant trip.

J19 is an example of where the justification does not identify a negative consequence that may make more frequent testing impracticable. The licensee states that testing would "... expose the HPSI header to charging pressure at a time when this is not a desired charging flow path." The reader is left to determine if this could overpressurize the HPSI header, cause an operational problem, or result in some other negative consequence.

Other DTJs that do not provide adequate justifications for not testing at power operation and/or during cold shutdowns are listed below along with the frequency for which additional justification is needed. In some of these cases the reviewer can confidently postulate the negative consequences of performing testing during power operations and/or during cold shutdowns (as applicable). However, due to differences in plant design and operation, the reviewer should not have to make these assumptions, therefore, the pertinent information should be furnished by the licensee. This is not to suggest that the licensee should change the proposed testing frequency for the affected valves, although, upon further evaluation, the licensee may elect to change these frequencies as is justified. These DTJs should be revised to adequately justify the deferral of valve testing.

J5	Cold Shutdowns
J8	Cold Shutdowns
J11	Quarterly and Cold Shutdowns
J21	Quarterly
J29	Quarterly
J35	Cold Shutdowns

8. The Basis for Justification paragraphs in J25, J32, and J37 contain statements such as "... failure of these valves during testing would render ... inoperable." The objective of testing is to verify the operational readiness of safety related components. Testing can reduce the availability of these components, however, any reduction in availability may be more than offset by the increase in reliability afforded by the testing. If a component is in a degraded state that could cause it to fail during testing, it may not be capable of performing its safety function. It is far better to detect this degraded condition during testing than to have the component fail when required to actuate to mitigate the consequences of an accident. These DTJs should be revised to adequately justify the deferral of valve testing or the valves should be tested at a more frequent Code interval.

9. The Alternate Testing paragraphs in J6 and J13 indicate that the subject valves will be tested during cold shutdowns. However, these paragraphs include further restrictions on when the listed valves can be tested (i.e., provided the feedwater system is able to be isolated from the steam generator and the feedwater lines are able to be drained).

Because of these provisions, these valves cannot be tested during many cold shutdowns. Therefore, these Cold Shutdown Justifications should be changed to Refueling Outage Justifications and a more detailed justification demonstrating the impracticality of testing these valves every cold shutdown should be included in the Basis for Justification.

10. J7 states "Since failure of these valves to function in the reverse flow direction would not interfere with the plant's ability to shutdown or to mitigate the consequences of an accident, these check valves shall be full-stroke exercised only in the open direction." Excessive back leakage of hot feedwater through similar valves at other facilities can render the associated AFW train inoperable due to vapor binding of the AFW pump or by exceeding the design temperature rating of system piping. In addition, the Working Group on Check Valves (OM-22) and the NRC have taken the position that a check valve exercise test should involve verifying a valve in both the open and the closed positions. The licensee should respond to this concern.

11. The Alternate Testing of J11 does not address valves SI-196, -199, -202, and -205. What testing is performed on these valves? In addition, the Basis for Justification needs to be clarified and augmented. The first two sentences do not apply to valve CH-469, because flow can be established through it using the charging pumps. Therefore, there is no justification for not exercising CH-469 during power operation. The third sentence applies only to valves SI-196, -199, -202, and -205. The basis should be clarified to indicate that this sentence does not apply to valves SI-343 and CH-469. The last sentence applies only to valve SI-343. There does not appear to be a technical basis that demonstrates the impracticality of full-stroke exercising valves SI-196, -199, -202, and -205 during cold shutdowns. The licensee should respond to these concerns.