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TECHNICAL EVALUATION REPORT
PUMP AND VALVE INSERVICE TESTING PROGRAM
TURKEY POINT, UNITS 3 AND 4

Docket Nos. 50-250 and 251

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ABSTRACT

This report presents the results of our evaluation of relief requests for the Turkey Point, Units 3 and 4, inservice testing program for safety-related pumps and valves.

PREFACE

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

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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 Turkey Point, Units 3 and 4, which was submitted by Florida Power and Light (FP&L) Company. Due to the great similarities between the units, relief requests for identical components in both units are evaluated together.

Section 2 of this report presents the FP&L Company bases for requesting relief from the requirements for valves followed by an evaluation and conclusion. Section 3 of this report presents similar information for a pump relief request.

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

1.1 IST Program Description

The licensee submitted these relief requests in Revision 4 of the IST program for Turkey Point, Units 3 and 4, dated April 14, 1992. That revision was transmitted by a letter from T. F. Plunkett to NRC dated May 14, 1992. The licensee's program covers the second ten-year IST interval for both units. The interval for Unit 3 runs from February 22, 1984 to February 21, 1994 and for Unit 4 from April 15, 1984 to April 14, 1994. The licensee's relief requests pertain to requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (the Code), Section XI, 1980 Edition through Winter 1981 Addenda and 10 CFR 50.55a.

1.2 IST Requirements

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

1.3 Scope and Limits of the Review

The scope of this review is limited to the relief requests addressed in this TER. 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 or NRC is not stated or implied. Any deviation from the Code test method, frequency, or other requirement

should be identified in the IST program and submitted in accordance with 10 CFR 50.55a for review and approval by NRC prior to implementation.

The evaluations in this TER are applicable only to the components or groups of components identified by the submitted requests. These evaluations may not be extended to apply to similar components that are not identified by the request at this or any other comparable facility without separate review and approval by NRC. Further, the evaluations and recommendations are limited to the requirement(s) and/or function(s) explicitly discussed in the applicable TER section. For example, the results of an evaluation of a request involving testing of the containment isolation function of a valve cannot be extended to allow the test to satisfy a requirement to verify the valve's pressure isolation function, unless that extension is explicitly stated.

2. VALVE TESTING PROGRAM

The following valve relief requests were evaluated against the requirements of ASME Section XI, 10 CFR 50.55a, and applicable NRC positions and guidelines. A summary is presented for each request followed by the licensee's basis for relief and the evaluation with the reviewer's recommendations. The requests are grouped according to system and Code Category.

2.1 Auxiliary Feedwater System

2.1.1 Category B Valves

2.1.1.1 Relief Request. VR-2 requests relief from the valve stroke timing requirements of Section XI, Paragraphs IWV-3413(b) and -3417, for the auxiliary feedwater (AFW) to steam generator supply valves, CV-3(4)-2816 thru -2818 and CV-3(4)-2831 thru -2833, and proposes to stroke time the valves and compare the measured times to assigned maximum stroke time limits.

2.1.1.1.1 Licensee's Basis for Requesting Relief--These valves open with nitrogen or instrument air pressure from a positioner signal to control auxiliary feedwater flow to the steam generators. In the event of a loss of air or electric power to the valve control system, they will fail to the closed position. When a valve is closed it can be opened by flow from the associated AFW pumps, thus it affords no isolation to prevent over-feeding the steam generators and therefore these valves have no specific safety function in the closed position.

The initial opening signal for these valves comes from a limit switch in the associated AFW pump steam supply motor-operated valve(s). After a valve opens, its position is determined by the automatic flow control system or with a manual controller located in the Control Room. Due to the automatic functioning of the valves and the absence of position indication devices, there is no practical mechanism for accurately measuring valve stroke time.

These valves are subjected to periodic testing that verifies proper operation of the valves upon initiation of an AFW system initiation and proper response and positioning of each valve to a respective control system output air signal. These tests provide a high level of confidence that the valves will perform their safety function as intended.

Stroke times of these valves are determined by adjusting the manual controller in the Control Room while a local observer at the valve measures the movement time of the valve stem. The stroke time measurements taken during testing of these valves are expected to be less than 10 seconds. Due to the relative speed of the valves and consideration of the method of measurement of these times, the test data is subject to considerable variation due to conditions unrelated to the material condition of the valve (e.g., test conditions, operator reaction time, communication lag).

The proposed alternate testing along with the additional testing performed outside the scope of the IST Program will provide adequate assurance that these valves will perform, as required, with a high degree of reliability.

Alternate Testing: The stroke time for these valves will be determined but the evaluation of the stroke times will not account for successive increases of measured stroke time per IWV-3417(a) with the change in test frequency as required. In lieu of this, an assigned maximum limiting value of stroke time will be established consistent with the operational requirements for the valve and of the AFW system and the stroke time history of the valves when known to be operating satisfactorily. Upon exceeding that limit, the subject valve will be declared inoperable and corrective action taken in accordance with IWV-3417(b).

2.1.1.1.2 Evaluation--These are modulating flow control valves in the AFW to steam generator supply lines. They operate in response to system or operator control signals. Accurately measuring the stroke time of these valves using conventional techniques is impractical since they are not equipped with control switches or position indicating devices. System redesign and modification would be needed to equip these valves with position indication. Requiring the modifications would be burdensome to the licensee.

The licensee proposes to measure the stroke times of these valves by locally observing the valve's response to an operator-controlled signal. However, the test is subject to a variety of influences that can affect the measured stroke time. Several of these influences, such as operator response time, either at the valve or at the controller, are unrelated to changes in the valve's condition. The results of this timing technique could vary considerably. Variations in stroke times from test to test will not be evaluated. The proposal is essentially a pass/fail test method that gets little information that can be assessed or trended (per IWV-3417[a]) to detect a change in valve condition. The timing method may not be sensitive enough to detect changes that indicate impending failure. The licensee has not shown that the proposed timing technique will effectively assess the operational readiness of these valves and provide a reasonable long-term alternative to the Code. Therefore, long-term relief should not be granted for the proposed test method.

An adequate method of detecting degradation and assessing operational readiness is needed for these valves. Accurately stroke timing or otherwise equivalently evaluating the condition of these valves is vital to assessing their operational readiness. Accessibility during testing is not a significant problem with these valves. Additionally, utility designed systems are commercially available that employ technologies that effectively measure stroke times on this type of valve. The licensee should consider alternate methods, such as ultrasonics, magnetics, acoustics, or diagnostic systems for stroke timing or otherwise monitoring the condition of these valves. The licensee should also consider alternate methods of causing the valve to stroke, such as introducing an artificial control signal electronically during the controller calibration checks. A reduced test frequency might be justified for a more comprehensive test depending on the difficulty and quality of the testing.

The licensee proposes to assign a maximum limiting stroke time to each of these valves based on the valve's stroke time history and system operational requirements. The measured stroke time will be compared to that stroke time limit and if the limit is exceeded, the valve will be declared inoperable. Appropriate stroke time acceptance criteria will help to ensure that failed valves are identified. Stroke time acceptance criteria should be

assigned considering the guidance of GL 89-04, Position 5. However, any uncertainty in the stroke time measurement method should be accounted for by an appropriate adjustment of stroke time acceptance criteria in the conservative direction.

The licensee's proposal gets some information about valve condition and provides an adequate alternative to the Code requirements until the end of the current IST interval. Yet, the proposal does not provide a reasonable long-term alternative to the Code test method requirements.

Based on the determination that compliance with the Code is impractical and burdensome, and considering the licensee's proposal, interim relief should be granted only until the end of the current 10-year IST program interval for each unit; that is until February 21, 1994 for Unit 3 and April 14, 1994 for Unit 4. Relief should not be granted beyond that point. By the end of that period the licensee should either comply with the Code or develop and implement a method of monitoring the condition of these valves that provides a reasonable alternative to the Code.

2.2 Chemical and Volume Control System

2.2.1 Category A Valves

2.2.1.1 Relief Request. VR-6 requests relief from the valve stroke timing requirements of Section XI, Paragraphs IWV-3413(b) and -3417, for the charging pumps to reactor coolant system (RCS) emergency boration valves, HCV-3(4)-0121, and proposes to stroke time the valve and compare the measured time to an assigned maximum stroke time limit.

2.2.1.1.1 Licensee's Basis for Requesting Relief--These valves are subjected to periodic testing that verifies proper operation of the valves and their response and positioning with respect to the control system output air signal. These tests provide a high level of confidence that the valves will perform their safety function as intended.

These valves are positioned from the Control Room by manually adjusting a DC electric current signal input to a current-to-air pressure converter that transmits a pre-determined air pressure to the valve positioner that adjusts valve position and the associated charging and reactor coolant pump seal injection flows. In the event of a loss of air or electric power to the valve control system, they will fail in the open position. Since there is no position indication or specific actuating signal for these valves to effect valve operation, measuring an accurate stroke time per IWV-3413 is not practical - however, local observation of valve movement and operation is an effective way of ascertaining the material condition of the valves.

Stroke times of these valves are determined by adjusting the manual controller in the Control Room while a local observer at the valve measures the movement time of the valve stem. The stroke time measurements taken during testing of these valves are expected to be less than 10 seconds. Due to the relative speed of the valves and consideration of the method of measurement of these times, the test data is subject to considerable variation due to conditions unrelated to the material condition of the valve (eg. test conditions, operator reaction time, communication lag).

Alternate Testing: The stroke time for these valves will be determined but the evaluation for these valves will not account for successive increases of measured stroke time per IWV-3417(a) with the change in test frequency as required. In lieu of this, an assigned maximum limiting value of stroke time will be established consistent with the operational requirements for the valve and the CVCS system and the stroke time history of the valves when known to be operating satisfactorily. Upon exceeding that limit, the subject valve will be declared inoperable and corrective action taken in accordance with IWV-3417(b).

2.2.1.1.2 Evaluation--These valves are in the charging lines to the RCS. They operate in response to system commands. Accurately measuring their stroke time using conventional techniques is impractical since they are not equipped with control switches or position indicating devices. System redesign and modification would be needed to equip these valves with position indication. Requiring the modifications would be burdensome to the licensee.

The licensee proposes to measure the stroke times by locally observing the valve's response to an operator-controlled signal. However, the test is subject to a variety of influences that can affect the measured stroke time. Several of these influences, such as operator response time, either at the valve or at the controller, are unrelated to changes in the valve's condition. The results of this timing technique could vary considerably. Variations in stroke times from test to test will not be evaluated. The proposal is essentially a pass/fail test method that gets little information that can be assessed or trended (per IWV-3417[a]) to detect a change in valve condition. The timing method may not be sensitive enough to detect changes that indicate impending failure. The licensee has not shown that the proposed timing technique will effectively assess the operational readiness of these valves and provide a reasonable long-term alternative to the Code. Therefore, long-term relief should not be granted for the proposed test method.

An adequate method of detecting degradation and assessing operational readiness is needed for these valves. Accurately stroke timing or otherwise equivalently evaluating the condition of these valves is vital to assessing their operational readiness. Accessibility during testing is not a significant problem with these valves. Additionally, utility designed systems are commercially available that employ technologies that effectively measure stroke times on this type of valve. The licensee should consider alternate methods, such as ultrasonics, magnetics, acoustics, or diagnostic systems for stroke timing or otherwise monitoring the condition of these valves. The licensee should also consider alternate methods of causing the valve to stroke, such as introducing an artificial control signal electronically during the controller calibration checks or disrupting power to the valve. A reduced test frequency might be justified for a more comprehensive test depending on the difficulty and quality of the testing.

The licensee proposes to assign a maximum limiting stroke time to these valves based on the their stroke time histories and system operational requirements. The measured stroke time will be compared to that stroke time limit. If the limit is exceeded, the valve will be declared inoperative. Appropriate stroke time acceptance criteria will help to ensure that failed valves are identified. Stroke time acceptance criteria should be assigned considering the guidance of GL 89-04, Position 5. However, any uncertainty in

the stroke time measurement method should be accounted for by an appropriate adjustment of stroke time acceptance criteria in the conservative direction.

The licensee's proposal gets some information about valve condition and provides an adequate alternative to the Code requirements until the end of the current IST interval. Yet, the proposal does not provide a reasonable long-term alternative to the Code test method requirements.

Based on the determination that compliance with the Code is impractical and burdensome, and considering the licensee's proposal, interim relief should be granted only until the end of the current 10-year IST program interval for each unit; that is until February 21, 1994 for Unit 3 and April 14, 1994 for Unit 4. Relief should not be granted beyond that point. By the end of that period the licensee should either comply with the Code or develop and implement a method of monitoring the condition of these valves that provides a reasonable alternative to the Code.

2.2.2 Category C Valves

2.2.2.1 Relief Request. VR-30 requests relief from the exercising frequency requirements of Section XI, Paragraph IWV-3521, for the boric acid transfer pump discharge check valves, 3(4)-0351, 3-0397A, 3-0397B, 4-0397C, and 4-0397D. The licensee proposes to part-stroke exercise valves 3-0397A, 3-0397B, 4-0397C, and 4-0397D open quarterly and to full-stroke exercise all the valves open each refueling outage.

2.2.2.1.1 Licensee's Basis for Requesting Relief--

Valves 3-0397A, 3-0397B, 4-0397C, and 4-0397D: During plant operation, due to concerns about over-borating the RCS, the boric acid pumps are tested via a recirculation flow path that is not [illegible]ded with any flow indication. Thus, since the flow rate through these va[illegible] cannot be measured, in accordance with the provisions of Reference 2.8, it is considered to be a partial-stroke test. At cold shutdown conditions the pumps can be lined up to pump to the charging pumps and thus through an instrumented line. however, testing these valves in this manner would require the introduction of highly concentrated boric acid solution from the boric acid tanks to the suction of the charging pumps and. thence, to the RCS. The additional boric acid introduced into the RCS would cause considerable operational difficulty during the ensuing startup.

Valves 3(4)-0351: Testing these valves requires the introduction of highly concentrated boric acid solution from the boric acid tanks to the suction of the charging pumps. This, in turn, would result in the addition of excess boron to the RCS whcih adversly affects plant power level and operationla parameters wtiht eh potential for an undesireabl plant trip or shudown. During cold shutdown, the additional boric acid introduced into the RCS would cause considerable operational difficulty during the ensuing startup.

Alternate Testing: During quarterly testing of the boric acid transfer pump discharge check valves 3-0397A, 3-0397B, 4-0397C, and 4-0397D will be part-stroke exercised (open) using the recirculation flow path to the boric acid tanks. During each reactor refueling outage each of these valves will be full-stroke exercised.

2.2.1.1.2 Evaluation--Check valves 3-0397A, 3-0397B, 4-0397C, and 4-0397D are at the discahrge of the transfer pumps. Check valves 3(4)-0351 are in the combined injection line to the volume control tank outlet at the charging pump suction point. These valves open to allow flow to the charging pumps during emergency boration. That line is instrumented to measure flow rate and is capable of passing the flow needed to full-stroke exercise these valves. However, the transfer system is filled with highly borated water and flow through that path would be directed into the RCS through the charging pumps. The boron injection into the RCS during power operation would cause reactor power fluctuations and possible a reactor trip. Injection during cold shutdown would increase boron concentration in the RCS to high levels. The RCS would have to be flushed to reduce boron levels prior to startup. That flushing would generate large quantities of waste water requiring processing. Therefore, full-stroke exercising these valves is impractical quarterly or during cold shutdowns.

A pump recirculation flow path to the boric acid tanks exists for part-stroke exercising valves 3-0397A, 3-0397B, 4-0397C, and 4-0397D during cold shutdowns. The licensee, therefore, proposes to part-stroke exercise them quarterly. However, valves 3(4)-0351 have no such provision, which makes part-stroke exercising them impractical at that frequency. The licensee proposes to full-stroke exercise all these valves each refueling outage. The licensee's proposal allows an adequate assessment of operational readiness and provides a reasonable alternative to the Code test frequency requirements.

Based on the determination that compliance with the Code test frequency requirements is impracticable and burdensome, and considering the licensee's proposed alternate testing frequencies, relief should be granted as requested.

2.3 Containment Spray System

2.3.1 Category A/C Valves

2.3.1.1 Relief Request. VR-9 requests relief from the test method and frequency requirements of Section XI, Paragraph IWV-3520, for 3(4)-0890A and -0890B, the containment spray header check valves, and proposes to disassemble, inspect, and manually exercise them on a sampling basis during refueling outages. The licensee will also part-stroke exercise these valves after reassembly and to leak rate test them at least once every 2 years in conjunction with Appendix J testing.

2.3.1.1.1 Licensee's Basis for Requesting Relief--

Exercise Open

Full-stroke exercising these valves to the open position would require operating each containment spray pump at nominal accident flow rate. Since no recirculation flow path exists downstream of these valves, the only flow path available for such a test would result in injecting radioactive-contaminated borated water into the containment spray headers and thence into the containment building via the spray nozzles. Dousing personnel and equipment in this manner is obviously undesirable.

Partial stroking of the valves can be achieved by pressurizing the upstream piping with air or nitrogen via the air test connection. Performing

partial flow exercising by this method during any mode of plant operation (at power or cold shutdown), however, has the potential of creating an airborne contamination personnel hazard in the auxiliary building or containment.

Exercise-Closed

Since these are simple-acting check valves with no provision for determining disc position, the only practical means of verifying closure involves performing a leak test. Performance of such a test would require considerable effort, including isolation and draining of the containment spray piping, system reconfiguration, hooking up and disconnecting leak testing equipment, and pressurizing the downstream piping with air or nitrogen while venting the upstream piping. Such a test is not practical during plant operation and could result in delays in the return to power operation during cold shutdown periods to the extent that it would be an undesirable burden on the plant staff. These valves remain closed at all times except during an MHA in which the Containment Spray system operates for containment cooling and de-pressurization.

The performance of these valves with respect to their capability to close and satisfactorily isolate the containment is adequately verified by the containment isolation valves testing program performed in accordance with 10CFR50, Appendix J.

Background

Each of these valves has been disassembled and inspected in the past and they have not displayed any indication of degradation that would impede their capability to perform their safety function to open. Past inspections were conducted as follows with no indication of a valve in-operability with respect to its capability to full open:

3-0890A	4-7-90
3-0890B	3-24-90
4-0890A	3-18-89 and 3-8-91
4-0890B	3-18-89 and 3-8-91

Alternate Testing: During each reactor refueling outage at least one of these valves will be disassembled, inspected, and manually exercised on a sequential and rotating schedule. If, in the course of this inspection a valve is found to be inoperable with respect to its function to fully open, then the other valve will be inspected during the same outage. During activities associated with valve disassembly and inspection and prior to system closure, appropriate precautions will be applied and inspections performed to ensure internal cleanliness standards are maintained and foreign materials are excluded from valve and system internals. These measures may include creating controlled work areas, maintaining a tool and equipment accounting system, installation of covers during non-work periods, and final close-out inspections.

Following valve disassembly, the subject valve will be partial-stroked in the open direction followed by a seat leakage test. These functional testing activities will ensure that the subject valve has been re-assembled and aligned properly. Each of these valves will be verified to be closed at least once every two (2) years in conjunction with Appendix J leak testing activities.

2.3.1.1.2 Evaluation--These are simple check valves without remote or other external indication of disk position. They close for containment isolation and open to provide containment spray system flow to the spray rings. The only flow path through these valves is through the containment spray rings, which would spray water inside containment. This would wet down equipment and structures inside containment and could cause damage to equipment and insulation. Full-stroke exercising these valves with flow is impractical during any plant operating mode. System modifications, such as installation of a full-flow test loop, would be necessary to permit full-stroke exercising them with fluid flow. It would be burdensome to require the licensee to perform these modifications.

The NRC considers valve disassembly and inspection to be a maintenance procedure and not a test equivalent to the exercising produced by fluid flow. This procedure has some risk, which might make its routine use as a substitute for testing undesirable when some method of testing is possible. However, a disassembly and inspection program might be the only practical method available for verifying the full-stroke exercise open capability of these valves. The licensee's proposed disassembly and inspection program appears to comply with the program described in Position 2 of GL 89-04, which is acceptable as an alternative to the Code full-stroke open exercising requirements.

The only practical method of verifying seat leak tightness is to perform a leak rate test. It is impractical to conduct that test quarterly or during each cold shutdown because that is a difficult and time consuming test for these valves. Additionally, many of the test connections are inside containment. Requiring leak rate testing each cold shutdown would be burdensome to the licensee. Access for testing presents a personnel safety hazard due to high radiation levels and proximity to high energy systems. The licensee proposes to leak rate test these valves at least once every two years in conjunction with Appendix J leak testing activities. The proposed frequency for closure testing provides a reasonable alternative to the Code test frequency requirements.

Based on the determination that compliance with the Code requirements is impracticable and burdensome, and considering the licensee's proposed alternate testing frequencies, relief should be granted as requested.

2.4 Safety Injection System

2.4.1 Category A/C Valves

2.4.1.1 Relief Request. VR-11 requests relief from the exercising frequency requirements of Section XI, Paragraph IWV-3521, for the safety injection system (SI) hot leg injection check valves, 3(4)-0874A and -0874B. The licensee proposes to full-stroke exercise them open during refueling outages and to verify their closure capability according to the plant Technical Specification test frequency described in the following proposal.

2.4.1.1.1 Licensee's Basis for Requesting Relief--Exercising these valves requires operating a SI pump and injecting into the RCS. At power operation this is not possible because the SI pumps cannot develop sufficient discharge pressure to overcome RCS pressure. During normal cold shutdown conditions, injection via the SI pumps is precluded by operational

restrictions related to low-temperature overpressurization (LTOP) protection concerns and Technical Specifications.

Since these are simple-acting check valves with no provision for determining disc position, the only practical means of verifying closure involves performing a leak test. Performance of such a test at each cold shutdown would constitute an unreasonable burden on the plant staff. The Technical Specifications, Section 4.4.6.2.2, establishes a more appropriate frequency for leak testing based on their pressure isolation function. The Technical Specification requirements are adequate to confirm valve operability in the closed position. The requirements of the Technical Specifications are as follows:

* At least once every 18 months;

* Prior to entering Mode 2 whenever the plant has been in cold shutdown for 72 hours or more and if leakage testing has not been performed in the previous 9 months;

* Prior to returning a valve to service following maintenance, repair, or replacement work on the valve; and

* Following valve actuation due to automatic or manual action or flow through the valve:

  1. Within 24 hours by verifying valve closure, and

  2. Prior to entering Mode 2 by verifying valve leak rate

Alternate Testing: At least once during each reactor refueling outage, each of these valves will be full-stroke exercised to the open position. Valve closure testing will conform to the requirements of Turkey Point Technical Specification, Section 4.4.6.2.2.

2.4.1.1.2 Evaluation--These valves open for SIS injection into the RCS hot legs and close for high pressure isolation. They are simple check valves without position indicating devices. It is impractical to full- or part-stroke exercise them open during power operations as the only flow path through these valves is from the SI pumps into the RCS. The SI pumps do not develop sufficient head to establish flow into the RCS at normal operating pressures. These valves should not be full- or part-stroke exercised with flow during cold shutdowns because the high discharge pressure of the SI pumps could cause a LTOP condition and extensive damage to the RCS. Extensive system redesign and modification would be needed to full-stroke exercise these valves quarterly during power operations or during cold shutdowns. That modification would be burdensome for the licensee to make.

The licensee proposes to full-stroke exercise these check valves open each refueling outage. That testing and frequency allows an adequate assessment of operational readiness and provides a reasonable alternative to the Code test frequency requirements for the open exercise.

The only practical method of determining the seat tightness of these valves is to perform a leak rate test. It is impractical to perform that test quarterly or during each cold shutdown because many of the test connections

are inside containment. Access for testing presents a personnel safety hazard due to high radiation levels and proximity to high energy systems. Requiring leak testing each cold shutdown would be burdensome to the licensee. The licensee proposes to leak rate test these valves following the schedule in the plant Technical Specifications as previously described. The proposed frequency for closure testing provides a reasonable alternative to the Code test frequency requirements.

Based on the determination that compliance with the Code requirements is impracticable and burdensome, and considering the licensee's proposed alternate testing frequencies, relief should be granted as requested.

2.4.1.2 Relief Request. VR-12 requests relief from the exercising frequency requirements of Section XI, Paragraph IWV-3521, for the combined SI injection header to RCS cold leg check valves, 3(4)-0875A, -0875B, and -0875C. The licensee proposes to part-stroke exercise these valves open during cold shutdowns and to full-stroke exercise them open each refueling outage. Their closure capability will be verified according to the plant Technical Specification test frequency described in the following proposal.

2.4.1.2.1 Licensee's Basis for Requesting Relief--Partial-flow testing of these valves requires injecting fluid into the RCS. At power operation this is not possible because neither the residual heat removal (RHR) or the SI pumps can develop sufficient discharge pressure to overcome RCS pressure. During normal cold shutdown conditions, however, injection via the RHR pumps can be accomplished.

With respect to full-stroke exercising of these valves to the open position, in order to satisfy the requirements of Generic Letter 89-04, a demonstration of the maximum accident flow must be performed or some other indication of full-stroke of the obturator must be provided. For these valves the maximum accident flow rate is defined as that flow rate resulting from a fully pressurized SI accumulator injecting into a de-pressurized RCS loop. Achieving this flow rate during power operation is not practical due to limitations associated with the RCS pressure.

It has been demonstrated, by past testing, that these valves can be opened by blowdown from a partially pressurized (100 psi) accumulator to the associated RCS loop. Performing such a test during plant operation is not possible due to the limitations associated with RCS pressure. The extensive preparations (including insulation removal, erection of scaffolding, etc.) required to perform such a test make it impractical to perform during cold shutdown periods.

The maximum flow rate achievable by means, other than accumulator discharge, is approximately 5000 gpm developed by two RHR pumps injecting into a de-pressurized RCS. This flow rate results in a flow velocity of approximately 20 feet per second (fps), which equates to approximately 40% of the peak flow rate expected during accumulator injection. Due to the system configuration, the total flow from the two RHR pumps (approximately 5000 gpm) is split between three (3) parallel trains, only one of which can be fully isolated from the remaining trains. Therefore approximately 5000 gpm can be directed through 3(4)-875A alone; however, in the case of valves 3(4)-875B and 3(4)-875C, the flow is split between the two valves, theoretically allowing

only 2500 gpm through each valve. This is clearly inadequate to fully open the "B" and "C" valves.

The valve manufacturer's data indicates that approximately 20 fps is the flow rate required to fully open these valves, which roughly equals the total flow rate achievable through -875A using two RHR pumps. In as much, sufficient margin does not exist whereby full-stroke exercise of the valve can be assured using RHR flow, and therefore it is questionable as to the capability of consistently full-stroking this valve with this limited flow rate such that non-intrusive testing could be employed effectively and reliably.

Since these are simple-acting check valves with no provision for determining disc position, the only practical means of verifying closure involves performing a leak test. Performance of such a test at each cold shutdown would constitute an unreasonable burden on the plant staff. The Technical Specifications, Section 4.4.6.2.2, establishes a more appropriate frequency for leak testing based on their pressure isolation function. The Technical Specification requirements are adequate to confirm valve operability in the closed position. The requirements of the Technical Specifications are as follows:

* At least once every 18 months;

* Prior to entering Mode 2 whenever the plant has been in cold shutdown for 72 hours or more and if leakage testing has not been performed in the previous 9 months;

* Prior to returning a valve to service following maintenance, repair, or replacement work on the valve; and

* Following valve actuation due to automatic or manual action or flow through the valve:

  1. Within 24 hours by verifying valve closure, and

  2. Prior to entering Mode 2 by verifying valve leak rate

Alternate Testing: Each of these valves will be partial stroke tested to the open position during cold shutdown. During each reactor refueling these valves will be full-stroke exercised. Valve closure testing will conform to the requirements of Technical Specification, Section 4.4.6.2.2

2.4.1.2.2 Evaluation--These check valves open as part of the combined SIS injection path into the RCS cold legs. They close for high pressure isolation. They are simple check valves without position indicating devices. It is impractical to full- or part-stroke exercise these valves open during power operations as the only flow path through these valves is from the SI pumps and accumulators into the RCS. The SI accumulators are at too low a pressure and the pumps do not develop sufficient head to establish flow into the RCS at normal operating pressures. These valves receive a part-stroke exercise with RHR flow through them during cold shutdowns. Extensive system redesign and modification would be needed to full-stroke exercise these valves quarterly during power operations or during cold shutdowns. That modification would be burdensome for the licensee to make.

The licensee proposes to full-stroke exercise these check valves open according to GL 89-04 each refueling outage. That testing and frequency allows an adequate assessment of operational readiness and provides a reasonable alternative to the Code test frequency requirements for the open exercise.

The only practical method of determining seat leak tightness is to perform a leak rate test. It is impractical to leak rate test these valves quarterly or during each cold shutdown because many of the test connections are inside containment. Access for testing presents a personnel safety hazard due to high radiation levels and proximity to high energy systems. Requiring leak testing each cold shutdown would be burdensome to the licensee. The licensee proposes to leak rate test these valves following the schedule in plant Technical Specification as previously described. The proposed frequency for closure testing provides a reasonable alternative to the Code test frequency requirements.

Based on the determination that compliance with the Code requirements is impracticable and burdensome, and considering the licensee's proposed alternate testing frequencies, relief should be granted as requested.

2.4.1.3 Relief Request. VR-13 requests relief from the exercising frequency requirements of Section XI, Paragraph IWV-3521, for the SI accumulator outlet check valves, 3(4)-0875D, -0875E, and -0875F, and proposes to full-stroke exercise them open and verify their closure by leak rate testing each refueling outage.

2.4.1.3.1 Licensee's Basis for Requesting Relief--Full-stroke exercising of these valves to the open position, based on the maximum accident flow rate resulting from SIS accumulator injection to a de-pressurized RCS loop, is not practical due to limitations associated with the effects of such a test on system components.

It has been demonstrated, by past testing, that these valves can be fully opened by blowdown from a partially pressurized (100 psig.) accumulator to the associated RCS loop. Performing such a test during plant operation is not possible due to the limited pressure capability of the SI tanks. During cold shutdown periods the extensive preparations (including insulation removal, erection of scaffolding, etc.) required to perform such a "dump" test make it impractical to perform during cold shutdown periods.

Since these are simple-acting check valves with no provision for determining disc position, the only practical means of verifying closure involves performing a leak test. It is impractical to leak test these valves quarterly or during cold shutdowns because many of the required manual isolation valves and test connections are inside containment. Access for testing would present a personnel safety hazard due to high radiation levels and the presence of high energy systems. Such a test could result in delaying the return to power operation during cold shutdown periods to the extent that it would be an undesirable burden on the plant staff.

Alternate Testing: At least once during each reactor refueling these valves will be full-stroke exercised to the open position. At least once during each reactor refueling these valves will be verified to close by means of a leakage rate test.

2.4.1.3.2 Evaluation--These check valves open to allow SI accumulator flow into the RCS cold legs. They close for high pressure isolation. They are simple check valves without position indication devices. It is impractical to full- or part-stroke exercise these valves open during power operations as the only flow path through them is from the SI accumulators into the RCS. The SI accumulators are at a pressure below normal operating RCS pressure and cannot establish flow into the RCS during power operation. Extensive system redesign and modification would be needed to full-stroke exercise these valves quarterly during power operations or during cold shutdowns. That modification would be burdensome for the licensee to make. However, if practical the licensee should part-stroke exercise these valves on the approach to cold shutdown as plant pressure is lowered just below accumulator pressure. If plant Technical Specifications require isolation of the accumulators prior to reducing plant pressure below accumulator pressure this limited part-stroke exercise would not be considered practical.

The licensee proposes to full-stroke exercise these check valves open each refueling outage. That testing and frequency allows an adequate assessment of operational readiness and provides a reasonable alternative to the Code test frequency requirements for the open exercise.

The only practical method of verifying the seat leak tightness of these valves is to perform a leak test. It is impractical to leak test these valves quarterly or during each cold shutdown because many of the test connections are inside containment. Requiring leak testing each cold shutdown would be burdensome to the licensee. Also, access for testing presents a personnel safety hazard due to high radiation levels and proximity to high energy systems. The licensee proposes to leak rate test these valves each refueling outage. That frequency provides a reasonable alternative to the Code test frequency requirements for closure verification.

Based on the determination that compliance with the Code requirements is impractical and burdensome, and considering the licensee's proposed alternate testing frequencies, relief should be granted as requested.

2.4.1.4 Relief Request. VR-14 requests relief from the exercising method and frequency requirements of Section XI, Paragraph IWV-3520, for the RHR injection check valves to the RCS cold legs, 3(4)-0876B and -0876C. The licensee proposes to part-stroke exercise them during cold shutdowns and to perform sample disassembly and inspection during refueling outages. The closure capability of these valves will be verified according to the Technical Specification test frequency described in the following proposal.

2.4.1.4.1 Licensee's Basis for Requesting Relief--Since no recirculation path exists, exercising these valves requires operating an RHR pump and injecting into the RCS. At power operation this is not possible due to system design pressure and interlocks that prevent operation of the RHR system in cooldown alignment when RCS pressure exceeds 515 psig.

During normal cold shutdown conditions, injection via the RHR pumps is practical and these valves can be full-stroke exercised. Since they have no position indicators and are installed such that the only lineup available causes them to form a parallel path, full accident flow through each valve cannot be confirmed and thus full-stroke verification by simple means is not

possible. Employing non-obtrusive methods for verifying full-stroke would require extensive preparations including containment entry, insulation removal, erection of scaffolding, etc. and thus is not practical during cold shutdown periods.

Since these are simple-acting check valves with no provision for determining disc position, the only practical means of verifying closure involves performing a leak test. Performance of such a test at each cold shutdown would constitute an unreasonable burden on the plant staff. The Technical Specifications, Section 4.4.6.2.2, establishes a more appropriate frequency for leak testing based on their pressure isolation function. The Technical Specification requirements are adequate to confirm valve operability in the closed position. The requirements of the Technical Specifications are as follows:

* At least once every 18 months;

* Prior to entering Mode 2 whenever the plant has been in cold shutdown for 72 hours or more and if leakage testing has not been performed in the previous 9 months;

* Prior to returning a valve to service following maintenance, repair, or replacement work on the valve; and

* Following valve actuation due to automatic or manual action or flow through the valve:

  1. Within 24 hours by verifying valve closure, and

  2. Prior to entering Mode 2 by verifying valve leak rate.

Alternate Testing: Each of these valves will be partial stroke tested to the open position during cold shutdown. During each reactor refueling each of these valves will be full-stroke exercised. Valve closure testing will conform to the requirements of Technical Specification, Section 4.4.6.2.2

2.4.1.4.2 Evaluation--These check valves open to allow flow from the RHR pumps into the RCS cold legs. They close for high pressure isolation. They are simple check valves without position indication devices. It is impractical to full- or part-stroke exercise these valves open during power operations as the only flow path through these valves is from the RHR pumps into the RCS. The RHR pumps do not produce sufficient head to establish flow into the RCS at normal operating pressures. Extensive system redesign and modification would be needed to verify a full-stroke exercise of these valves quarterly during power operations or during cold shutdowns. That modification would be burdensome for the licensee to make.

The licensee proposes to part-stroke exercise these valves during cold shutdowns and to full-stroke exercise them open each refueling outage. That testing and frequency allows an adequate assessment of operational readiness and provides a reasonable alternative to the Code test frequency requirements for the open exercise.

The only practical method of determining the seat leak tightness of these valves is to perform a leak rate test. It is impractical to leak test

these valves quarterly or during each cold shutdown because many of the test connections are inside containment. Requiring leak testing each cold shutdown would be burdensome to the licensee. Also, access for testing presents a personnel safety hazard due to high radiation levels and proximity to high energy systems. The licensee proposes to leak rate test these valves each refueling outage. That frequency provides a reasonable alternative to the Code test frequency requirements for closure verification.

Based on the determination that compliance with the Code requirements is impractical and burdensome, and considering the licensee's proposed alternate testing frequencies, relief should be granted as requested.

2.4.1.5 Relief Request. VR-28 requests relief from the exercising frequency requirements of Section XI, Paragraph IWV-3521, for reverse flow closure testing of the nitrogen supply to pressurizer relief tank (PRT) check valves, 3(4)-0519. The licensee proposes to full-stroke exercise them each refueling outages.

2.4.1.5.1 Licensee's Basis for Requesting Relief--These check valves are normally closed. The only effective method of verifying closure of these valves is to perform a reverse flow (leak test). This would require entry into the containment building and thus is impractical to perform during plant operation and would be an unreasonable burden on the plant staff to perform at cold shutdown.

Alternate Testing: At least once every two years each of these valves will be verified to close in conjunction with the Appendix J leak testing program.

2.4.1.5.2 Evaluation--These check valves open to allow flow from the nitrogen supply into the PRT. Their safety function is to close for containment isolation. They are simple check valves without position indication devices. The only practical method of determining the seat leak tightness of these valves is to perform a leak rate test. It is impractical to leak test these valves quarterly or during each cold shutdown because many of the test connections are inside containment. Access for testing presents a personnel safety hazard due to high radiation levels and proximity to high energy systems. Requiring leak rate testing each cold shutdown would be burdensome to the licensee.

The licensee proposes to leak rate test these valves each refueling outage. That frequency provides a reasonable alternative to the Code test frequency requirements for closure verification.

Based on the determination that compliance with the Code test frequency requirements is impractical and burdensome, and considering the licensee's proposed alternate testing frequency, relief should be granted as requested.

2.5 Various Systems

2.5.1 Category A and A/C Containment Isolation Valves

2.5.1.1 Relief Request. VR-33 requests relief from the corrective action requirements of Section XI, Paragraph IWV-3427(b), for the various containment isolation valves (CIVs) identified in the licensee's program. The

licensee proposes to follow the requirements as stated in GL 89-04, Position 10, for these valves and not to apply IWV-3427(b) to test results.

2.5.1.1.1 Licensee's Basis for Requesting Relief--IWV-3427(b) specifies additional maintenance and increased testing frequencies for valves sizes 6-inches and larger. The usefulness of these additional requirements does not justify the burden of compliance with these requirements. (Reference NRC GL 89-04)

Alternate Testing: The corrective action as specified in Subparagraph IWV-3427(b) will not be applied to test results. This is consistent with the requirements of Reference 2.8.

2.5.1.1.2 Evaluation--These valves close to perform a containment isolation. The licensee proposes to leak rate test them per GL 89-04, Position 10, without IWV-3427(b). Testing CIVs as specified in GL 89-04, Position 10, gives adequate assurance of their operational readiness for performing the containment isolation function.

The requirements of IWV-3427(b) are applicable to Category A valves that perform a leakage restriction function, other than or in addition to, containment isolation. Valves in this group include pressure isolation valves, even if they also perform a containment isolation function. The proposal to not endorse IWV-3427(b) does not provide a reasonable alternative to the Code for these valves.

Relief is granted to test the CIV function of CIVs per GL 89-04, Position 10. This relief is limited to assessing the containment isolation capability of these valves. Relief from IWV-3427(b) applies only to testing of the containment isolation function. For Category A valves that perform any other leakage restriction function, in addition to or other than containment isolation, the requirements of IWV-3427(b) should be met. The licensee should revise plant procedures, as necessary, to be consistent with this approach.

3. PUMP TESTING PROGRAM

The following pump relief request was evaluated against the requirements of ASME Section XI, 10 CFR 50.55a, and applicable NRC positions and guidelines. A summary is presented of the request followed by the licensee's basis for relief and the evaluation with the reviewer's recommendations.

3.1 General Pump Relief Request

3.1.1 Liquid in Pump Inlet Pressure Instrument Gage Lines

3.1.1.1 Relief Request. PR-12 requests relief from determining the presence or absence of liquid in pressure instrument gage lines as required by Section XI, Paragraph IWP-4210, for all pumps in the IST program, and proposes to determine the presence or absence of liquid in pump inlet pressure gage lines only if the presence or absence could produce a difference of more than 0.25% in the calculated value of pump differential pressure.

3.1.1.1.1 Licensee's Basis for Requesting Relief--When this requirement is applied where measured pressures are at relatively low levels, e.g., suction pressure, the 0.25% limit many times results in complicated venting procedures and related health physics risks associated with the disposal of radioactive contaminated water with no commensurate improvement of test reliability.

Normally the only quantitative use of suction pressure measurements, where significant accuracy is required, is in determining pump differential pressure or head. In most cases the pump discharge pressure exceeds the suction pressure by at least a factor of five (5). This being the case, a 0.25% error introduced into the suction pressure measurement results in an error of 0.05% in the differential pressure calculation. This is insignificant in light of the potential 6% error allowance applied to both the suction and discharge pressure instruments (Ref IWP-4110).

In all cases where this relief request is applied the potential error due to the presence of air in a sensing line is insignificant when compared to the margin between actual suction pressure and minimum NPSH required for pump operation. Minimum NPSH is assured by pre-suction pressure measurements as well as system alignments pertinent to the plant safety analysis.

Alternate Testing: If the presence or absence of liquid in a gage line used for sensing pump suction pressure could produce a difference of more than 0.25% in the calculated value of pump differential pressure, means shall be provided to ensure or determine the presence or absence of liquid as required for the static correction used.

3.1.1.1.2 Evaluation--The purpose for the Code requirements associated with test instrumentation is to produce test data that is sufficiently accurate and repeatable to evaluate pump condition and detect degradation. Deviations from these Code requirements which could compromise the ability to detect pump degradation are not acceptable. However, if compliance with a Code requirement presents a hardship without a compensating increase in the level of quality and safety, relief can be granted from that requirement.

One reason that pump inlet pressure is measured for IST is to assure that adequate suction pressure is available to meet pump NPSH requirements. The licensee indicated that there is sufficient margin for pump NPSH that the effects of instrument error due to the presence or absence of liquid in the inlet pressure gage lines would be insignificant. Pump hydraulic performance is determined by fixing pump flow rate or differential pressure at a reference value and evaluating the measurement of the other parameter. If there are significant variations in test conditions and measurements that are unrelated to pump condition, they could provide false indication of pump degradation or mask actual degradation. Therefore, test measurements should be as accurate and repeatable as possible.

Venting instrument lines or performing other test procedures to assure that the inlet pressure instrument gage lines have the proper amount of liquid can be a hardship to the licensee because of the complicated procedures, personnel hazards, and generation of radioactive waste involved. The amount of error that could be introduced in the differential pressure measurement by allowing the licensee's proposed alternative would be less than 0.25% of the differential pressure measurement. This amount of measurement error is considered insignificant, therefore, further reduction by complying with the Code would not provide a commensurate increase in the level of quality and safety. The licensee's proposed testing should not affect the ability to determine pump operational readiness and provides a reasonable alternative to the Code.

Based on the determination that compliance with the Code requirements would be a hardship without a compensating increase in the level of quality and safety, relief should be granted from the Code as requested.

APPENDIX A

IST PROGRAM ANOMALIES IDENTIFIED DURING THE REVIEW