UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO THE REVISED INSERVICE TESTING PROGRAM AND REQUESTS FOR RELIEF

TENNESSEE VALLEY AUTHORITY

BROWNS FERRY NUCLEAR PLANT UNITS 1, 2, AND 3

DOCKET NUMBERS 50-259, 50-260, AND 50-296

1.0 INTRODUCTION

The Code of Federal Regulations, 10 CFR 50.55a, requires that inservice testing (IST) of certain American Society of Mechanical Engineers (ASME) Code Class 1, 2, and 3 pumps and valves be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel Code (the Code) and applicable addenda, except where relief has been requested and granted or proposed alternatives have been authorized by the Commission pursuant to 10 CFR 50.55a(f)(6)(i), (a)(3)(i), or (a)(3)(ii). In order to obtain authorization or relief, the licensee must demonstrate that: (1) conformance is impractical for its facility; (2) the proposed alternative provides an acceptable level of quality and safety; or (3) compliance would result in a hardship or unusual difficulty without a compensating increase in the level of quality and safety. Section 50.55a(f)(4)(iv) provides that inservice tests of pumps and 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 Commission approval. NRC guidance contained in Generic Letter (GL) 89-04, "Guidance on Developing Acceptable Inservice Testing Programs," provided alternatives to the Code requirements determined to be acceptable to the staff and authorized the use of the alternatives in Positions 1, 2, 6, 7, 9, and 10 provided the licensee follows the guidance delineated in the applicable position. When an alternative is proposed which is in accordance with GL 89-04 guidance and is documented in the IST program, no further evaluation is required; however, implementation of the alternative is subject to NRC inspection.

Section 50.55a authorizes the Commission to grant relief from ASME Code requirements or to approve proposed alternatives upon making the necessary findings. The NRC staff's findings with respect to granting or not granting the relief requested or authorizing the proposed alternative as part of the licensee's IST program are contained in this safety evaluation.

2.0 BACKGROUND

By letter dated October 22, 1993, the NRC staff issued a safety evaluation for the second 10-year IST interval for the Browns Ferry Nuclear Plant (BFN)

ENCLOSURE

Units 1, 2, and 3. That letter included a request that the Tennessee Valley Authority (TVA, or the licensee) provide a revised IST program to address anomalies identified in the course of NRC review. On October 29, 1993, TVA submitted IST program changes for BFN Units 1, 2, and 3. On May 2, 1994, TVA submitted information requested by the NRC staff in its October 22, 1993 letter. On November 14, 1994, TVA provided a revised IST program addressing the anomalies. The NRC issued a safety evaluation of the revised IST program and anomalies on May 16, 1995, and requested additional information on two anomalies. TVA submitted a further revision of the IST program on November 14, 1995, addressing the two remaining anomalies, and revising six relief requests. The licensee's IST program covers the second 10-year IST interval from September 1, 1992, to August 31, 2002. The BFN Units 1, 2, and 3 IST program, was developed in accordance with the requirements of the 1986 Edition, Section XI, of the ASME Boiler and Pressure Vessel Code. Results of the NRC staff review of this information is presented below.

3.0 REVISED RELIEF REQUESTS

TVA intends to use sample disassembly and inspection in partial accordance with GL 89-04, Position 2, to verify the full-stroke opening or closure capability of several check valves. The TVA sample valve disassembly and inspection program includes a schedule of once every operating cycle. This is not in accordance with GL 89-04, Position 2, which gives a schedule of once every refueling outage. Therefore, the NRC staff treated the relief requests as proposed alternates for the schedule as well. The affected relief requests are PV-13, PV-14, PV-18, and PV-29. Relief request PV-30 is in accordance with the GL 89-04, Position 2 schedule. Also, the class designation of the affected valves for relief request PV-21 was changed.

3.1 Relief Request PV-13

The licensee requests relief from the check valve exercise requirements of IWV-3521 and IWV-3522 for class 3 check valves 0-23-601, 0-23-603, 0-23-605, and 0-23-607 because of test impracticality. TVA proposes testing in accordance with the guidance provided in GL 89-04, Position 2, with a delayed testing schedule of every valve in the affected group when degradation is determined.

3.1.1 Basis for Relief

The licensee states:

> These check valves, located in the keep-fill lines for the RHR [Residual Heat Removal] service water system, permit raw service water flow into each RHRSW [Residual Heat Removal Service Water] header while preventing process flow in the reverse direction during RHRSW system operation. There are no vent, drain, or test connections located upstream of the check valves that would allow backflow testing. Nonintrusive testing of these valves using ultrasonics and/or acoustics is not practical for these valves due to the inability to force the valves closed quickly enough to generate a repeatable acoustic or ultrasonic signal. The

isolation valves used to force the valves closed are not capable of quick opening or closing (the valves have handwheel operators). The valve pistons therefore contact their seat lightly. Ultrasonic and acoustic traces obtained during testing for feasibility were inconclusive due to piston flutter and system noise. No acoustic trace of piston contact on closure could be discerned and the ultrasonic trace did not reveal full closed position (movement of the piston was detected in the mid-range position, but not at closure). Radiography is not considered practical due to a review of test shots on other lift check valves of similar size and material. The radiographs that were reviewed did not reveal sufficient detail to determine whether the valve pistons were completely seated. Test equipment for detecting disc position using magnetics has not been purchased and was therefore unavailable for use in determining feasibility.

3.1.2 Alternative Testing

The licensee proposes:

> The valves will be proven to close once every operating cycle by disassembly and inspection. Because the check valves are of the same design [manufacturer, size, model number, and materials of construction] and service conditions they will be grouped for disassembly on a rotating basis in accordance with position 2 in NRC Generic Letter 89-04. If a check valve selected for disassembly fails the inspection criteria of GL 89-04, then the other three keep-fill check valves in the affected test group will be disassembled and inspected during the next available system outage. The design of these check valves results in less chance of problems caused by disassembly and reassembly. Because the piston is positioned down inside the valve body until forced open by water pressure, there is virtually no chance of kinking the piston in the valve cylinder when reinstalling the valve bonnet. The inspection and cleaning (as necessary) of the valve internals after disassembly ensures that the valve piston is free to move when it is reassembled.

The NRC staff's evaluation and conclusion regarding relief request PV-13 are stated in Section 3.5 and Section 3.6, respectively.

3.2 Relief Request PV-14

The licensee requests relief from the check valve exercise requirements of IWV-3521 and IWV-3522 for class 3 check valves for the emergency equipment cooling water and the raw cooling water because of test impracticality. TVA proposes testing in accordance with the guidance provided in GL 89-04, Position 2, with an unspecified testing schedule of every valve in the affected group when degradation is determined.

3.2.1 Basis for Relief

The licensee states:

> System design prevents the valves from being verified closed by reverse flow or other conventional means. Most of the valves are verified open quarterly by flow verification, and apparent disc free movement is indicated then. These check valves cannot be forced closed quickly enough to generate a detectable acoustic signal. The isolation valves used to force the valves closed are not capable of quick opening or closing (the valves have handwheel operators). This means that most of the check valve discs contact their seat lightly, generating insufficient noise to be detected by the acoustic monitor used in testing. Noise in the system masks whatever closing signals are generated, and the close proximity of series check valves makes it extremely difficult to identify closure of individual check valves. The test equipment purchased to perform nonintrusive testing cannot obtain an ultrasonic trace of disc position for stainless steel check valves, which includes most of these check valves. Nonintrusive testing of these valves has therefore been determined to be impractical due to the inability to obtain repeatable acoustic and ultrasonic signals. Radiography has also been determined to be impractical after a review of test shots on similar check valves. The radiographs that were reviewed did not reveal sufficient detail to determine valve closure. Test equipment for detecting disc position using magnetics has not been purchased and was therefore unavailable for use in determining feasibility.

3.2.2 Alternative Testing

The licensee proposes:

> These check valves will be grouped according to design [manufacturer, size, model number, and materials of construction] and service conditions and dissembled on a rotating basis in accordance with Position 2 in NRC Generic Letter 89-04. If a check valve selected for disassembly fails the criteria of GL 89-04, then the other check valves in the affected test group will be disassembled and inspected during the same system or refuel outage (whichever is applicable). Because some of the valves are inspected at times other than refuel outages, disassembly of all remaining valves in an affected test group will be done expeditiously, but with regard for effect on operating systems.

The NRC staff's evaluation and conclusion regarding relief request PV-14 are stated in Section 3.5 and Section 3.6, respectively.

3.3 Relief Request PV-18

The licensee requests relief from the check valve exercise requirements of IWV-3521 and IWC-3522 for class 2 check valves 73-633, 73-634, 73-635, 73-636,

71-597, 71-598, 71-599, and 71-600 because of test impracticality. TVA proposes testing in accordance with the guidance provided in GL 89-04, Position 2 with an unclear testing schedule of every valve from the affected group when degradation is determined.

3.3.1 Basis for Relief

The licensee states:

> Valve configuration prevents the valves from being proven open or closed on an individual basis. A flow path through the valves as a whole could be verified quarterly, but the location of the valves on the turbine exhaust piping for the HPCI [High Pressure Coolant Injection] and RCIC [Reactor Core Isolation Cooling] turbines could be hazardous to plant personnel and result in unnecessary dose unless the HPCI and RCIC systems were taken out of service to perform the test. This would require entry into a LCO [limiting condition for operation] due to HPCI or RCIC unavailability and would raise the Probabilistic Safety Analysis (PSA) Core Damage Frequency (CDF) by 193% with RCIC out of service (CDF with HPCI out of service would be greater). Nonintrusive testing using acoustic and ultrasonic test equipment has been evaluated and determined to be impractical due to limitations in piping configuration and test equipment. The two types of test equipment considered in the evaluation are those used for flow measurement (ultrasonics) and for verification of piston position (ultrasonics and acoustics). These valves are lift type check valves installed in a parallel branch line configuration with a crosstie between the two branches. These valves are in close proximity to each other and are usually dry. There is not sufficient length of straight pipe to mount ultrasonic transducers for measuring flow. The test equipment used to perform ultrasonic flow and position testing requires piping full of water in order to measure flow or detect piston position. It would be difficult to inject enough water to maintain the piping full of water so that the test could be performed repeatedly. There is also the problem of detecting each individual check valve opening from among the other three check valves. Acoustic detection of individual valve opening would also not be possible with the noise associated with the flow necessary to open all the valves, especially if air is used. Radiography is not considered practical due to a review of test shots of other lift check valves of similar size and material. The radiographs that were reviewed did not reveal sufficient detail to determine whether the valve pistons were completely seated. In order to obtain a radiograph of the valves in the open position, a prolonged injection would have to be performed. Also, the coordination and setup of equipment on top of the torus would be difficult. Test equipment for detecting disc position using magnetics has not been purchased and was therefore unavailable for use in determining feasibility.

3.3.2 Alternative Testing

The licensee proposes:

> Ability of the valves as a group to open and break vacuum in the HPCI/RCIC turbine exhaust pipe will be demonstrated by testing at a cold shutdown frequency (provided ALARA [as low as reasonable achievable] and plant conditions allow). By connecting a pressurized air source to a test tap downstream of the valves, a flow path through at least two of the four valves will be demonstrated. This verification will be supplemented by the existing once per operating cycle disassembly inspection. These valves will be grouped according to design [manufacturer, size, model number, and materials of construction] and service conditions and disassembled on a rotating basis in accordance with NRC Generic Letter 89-04, Position 2. If the valve selected for disassembly fails the criteria of GL 89-04, then the remaining valves in the affected test group will be disassembled and inspected during the same system or refuel outage (whichever is applicable). The design of these check valves results in less chance of problems caused by disassembly and reassembly. Because the piston is positioned down inside the valve body until forced open by steam pressure, there is virtually no chance of kinking the piston in the valve cylinder when reinstalling the valve bonnet. The inspection and cleaning (as necessary) of the valve internals after disassembly ensures that the valve piston is free to move when it is reassembled.

The NRC staff's evaluation and conclusion regarding relief request PV-18 are stated in Section 3.5 and Section 3.6, respectively.

3.4 Relief Request PV-29

The licensee requests relief from the check valve exercise requirements of IWV-3521 and IWC-3522 for class 2 check valves 71-502, 71-589, 73-505, and 73-625 because of test impracticality. TVA proposes testing in accordance with the guidance provided in GL 89-04, Position 2 with an unspecified testing schedule when degradation is determined.

3.4.1 Basis for Relief

The licensee states:

> System design prevents the valves from being verified closed by reverse flow or other conventional means. Since the valves are verified open quarterly by flow verification, apparent disc free movement is indicated at that time. The presence of filled HPCI/RCIC pump discharge piping is verified once a month, providing indirect evidence of the closed position of the pump suction check valves. The HPCI/RCIC condensate return check valves allow condensate return from the RCIC and HPCI local condensers to the pump suction lines during the quarterly

operability surveillance tests. This indicates open position of the condensate return line check valves. Nonintrusive testing has been evaluated and determined to be impractical. It has been decided based on experience with ultrasonic flow testing on the pump minimum flow lines that a repeatable acoustic or ultrasonic signal could not be obtained amid the noise and vibration associated with turbine operation. The startup of the RCIC and HPCI turbines are high-risk situations requiring personnel to evacuate the immediate area of the turbines and it is undesirable to continue turbine operation any longer than necessary due to concerns over torus heatup. Any problems in obtaining a conclusive acoustic or ultrasonic trace could prolong turbine operation. Radiography is not considered practical due to a review of test shots on other check valves of similar size and material. The radiographs that were reviewed did not reveal sufficient detail to determine whether the valve discs were completely seated. Test equipment for detecting disc position using magnetics has not been purchased and was therefore unavailable for use in determining feasibility.

3.4.2 Alternative Testing

The licensee proposes:

> These valves will be grouped according to design [manufacturer, model number, and materials of construction] (including size) and service conditions. They will then be proven to close once per operating cycle by disassembly and inspection on a rotating basis in accordance with Position 2 of NRC Generic Letter 89-04. If a check valve selected for disassembly fails the criteria of GL 89-04, then the remaining valves (if any) in the affected test group will be disassembled and inspected and corrective actions performed (if necessary).

The NRC staff's evaluation and conclusion regarding relief request PV-29 are stated in Section 3.5 and Section 3.6, respectively.

3.5 Evaluation of PV-13, 14, 18, and 29

This evaluation is valid for relief requests PV-13, 14, 18, and 29.

ASME Code Requirements: The Code requires a full-stroke exercise of certain safety-related check valves quarterly, if practical, and provides a hierarchy for part-stroke and full-stroke exercising quarterly, during cold shutdowns, or during refueling outages if quarterly full-stroke exercising is impractical. The licensee proposes to dissemble and inspect the check valves in relief requests PV-13, 14, 18, and 29 on a sampling basis at an interval similar to a refueling outage interval.

Inservice Testing of Check Valves: The check valves of relief requests PV-13, 14, 18, and 29 cannot be full-stroke tested with flow without creating a

hardship on or posing an unusual difficulty for the licensee in establishing a configuration to perform testing. If the requirements for full-stroke exercising were imposed on the licensee, temporary or permanent modifications to the plant would be necessary to meet the testing requirements. Alternatively, the licensee has used disassembly and inspection as discussed in Position 2 of GL 89-04 for verifying the full-stroke capability of the valves. It has also investigated the use of nonintrusive techniques for verifying obturator movement for the valves which can be flow tested and has concluded that such means cannot be meaningfully applied.

Since it is impractical or unusually difficult to meet the exercise requirements of IWV-3522 (or paragraph 4.3.2 of OM Part 10), the licensee's proposal to disassemble and inspect the valves may be the only practical method to verify the full-stroke capability of the valves. The proposed method conforms with guidance in GL 89-04, Position 2, and is permitted by OM-10, paragraph 4.3.2.4(c); however, the proposed frequency varies from both Position 2 (sampling basis with a minimum of one valve per group each refueling outage) and paragraph 4.3.2.4(c) (each valve every refueling outage).

For relief request PV-18, the ability of the valves as a group to open and break vacuum in the HPCI/RCIC turbine exhaust pipe will be demonstrated by testing at a cold shutdown frequency (provided ALARA and plant conditions allow). A flow path through at least two of the four valves will be demonstrated. This test will complement the once per operating cycle sample disassembly/inspection test. This valve stroke test conforms with the guidance in GL 89-04, Position 2 to perform partial valve stroking quarterly or during cold shutdowns, or after reassembly, if possible.

Proposed Alternative: The licensee has proposed to establish a grouping of valves and to use a sampling plan for disassembling and inspecting one valve per group each operating cycle (i.e., during any plant mode). Such a schedule is not necessarily based directly on the GL 89-04 or OM-10 interval of "refueling outage," but could be based on a comparable length of time. The proposed schedules could allow disassembly and inspection to occur during power operations rather than during refueling outages. The following issues affect the proposed schedule for the valves that could be disassembled and inspected during power operations:

- acceptability of the refueling outage interval frequency,
- acceptability of entering a technical specification limiting conditions for operation (LCO) action statement to perform regularly scheduled maintenance similar to preventive maintenance (PM), and
- appropriate corrective actions if a problem is identified during the disassembly and inspection, both for the specific valve and for the valves in the group.

GL 89-04, Position 2, indicates that for sample disassembly and inspection a "different valve of each group is required to be disassembled, inspected, and

manually full-stroke exercised at each successive refueling outage." The reasons that the generic letter specified that the activity be performed during refueling outages were the personnel hazards involved and the system operating restrictions. In many cases where disassembly and inspection are used in lieu of testing, there are reasons that the disassembly must be performed during an extended outage (e.g., the reactor coolant system must be depressurized, the reactor vessel must be drained to the mid-loop level, or the activity requires an entire safety system to be removed from service). However, where valves can be safely and practically disassembled and inspected during power operation, doing so on an interval related to the refueling outage (e.g., once every operating cycle) could provide an adequate level of assurance of the operational readiness of the valves. As noted by the licensee, the possibility of establishing such a schedule was discussed in NUREG-1482, but with the added caution that entry into an LCO may not be acceptable.

In implementing an alternate schedule, (1) the same constraints for corrective actions related to the remaining valves in the group must be applied and (2) the assessment of the risk and other operability issues in removing a train of the system from service for performance of a maintenance activity must be considered.

Remaining Valves in the Group: The licensee has requested that, when disassembling a valve during any plant mode indicates a problem, the remaining valves in the group will be inspected "during the next available system outage" (PV-13) or "expeditiously, but with regard for effect on operating systems" (PV-14) or "during the same system or refuel outage" (PV-18) or "if necessary" (PV-29). GL 89-04, Position 2, states that "if the disassembled valve is not capable of being full-stroke exercised or there is binding or failure of valve internals, the remaining valves in that group must also be disassembled, inspected, and manually full-stroke exercised during the same outage." Since GL 89-04 grouping criteria requires "each valve in the group be the same design (manufacturer, size, model number, and materials of construction) and have the same service conditions including valve orientation," the valves in a sample group should be subject to the same degradation mechanisms and rates; otherwise, the valve grouping is inappropriate and the valves should be placed in smaller groups. Therefore, failure of the disassembled valve in a sample group places in question the operational readiness of the remaining group valves. Until the operational readiness of these valves is verified by disassembly and inspection or by testing, their continued capability to perform their function cannot be assumed.

If a valve disassembled during power operation is found to be failed or excessively degraded, the licensee should immediately (generally before the end of the shift during which the failure is discovered) analyze the valve failure to determine the degradation mechanism and the likelihood that the other group valves are affected significantly by this mechanism. If the licensee's evaluation indicates that the operability of the remaining valves can be justified (based on past examinations, measurements, etc.), the valves need not be immediately declared inoperable. However, all group valves should be disassembled and inspected or have their continued operability justified or

verified by testing within the TS action statement time specified for one train of the safety system being inoperable. If there is no associated LCO, then the maximum time period before completing the disassembly and inspection of the remaining valves must be determined by the analysis of the cause of degradation.

The licensee's proposal to disassemble and inspect the remaining valves "during the next available system outage" (PV-13) or "expeditiously, but with regard for effect on operating systems" (PV-14) or "during the same system or refuel outage" (PV-18) or "if necessary" (PV-29) does not conform with the above stated approach which is consistent with the guidance in GL 91-18, "Information to Licensees Regarding Two NRC Inspection Manual Sections on Resolution of Degraded and Nonconforming conditions and on Operability," November 7, 1991. Therefore, while a maximum time for disassembly and inspection of the remaining valves may be established, the issues related to continued operation with potentially inoperable valves may not be ignored. The licensee must determine the acceptability of continued operation on a case-by-case basis.

Entry into a Limiting Condition for Operation (LCO) Action Statement: The NRC's guidance in GL 89-04, Position 2, did not indicate the acceptability of entering an LCO to perform disassembly and inspection of check valves and has not recommended that licensees pursue this course of action; however, the licensee's request has been considered and is evaluated herein.

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

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

- The disassembly and inspection should be carefully planned to prevent repeatedly entering and exiting LCO action statements.

- Other related equipment should not be removed from service during the performance of the on-line maintenance activity.

- Maintenance should not be performed on-line unless confidence in the operability of the redundant subsystem is high. If equipment is degraded or trending towards a degraded condition in one train of a safety system, the redundant train should not be removed from service to perform on-line disassembly and inspection.

- While performing an on-line maintenance activity, avoid performing other testing or maintenance that would increase the likelihood of a transient. There should be a reasonable expectation that the facility will continue to operate in a stable manner.

In addition, 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," becomes effective July 10, 1996. Paragraph (a)(3) of Section 50.65 requires that licensees assess the total impact on plant safety before taking plant equipment out of service for monitoring or preventive maintenance.

3.6 Conclusions for PV-13, PV-14, PV-18, and PV-29

This conclusion is valid for relief requests PV-13, PV-14, PV-18, and PV-29. Based on the determination that compliance with the exercising requirements of the Code is impractical and burdensome, and considering that sample disassembly and inspection is an acceptable alternative according to GL 89-04, Position 2, relief is granted pursuant to 10 CFR 50.55a(f)(6)(i) to verify the capability of the valves to stroke by disassembly and inspection.

Additionally for PV-18, the ability of two valves to open and break vacuum in the HPCI/RCIC turbine exhaust pipe will be demonstrated by connecting a pressurized air source downstream of the valves on a cold shutdown frequency (when ALARA or plant conditions allow). This test will complement the sample disassembly and inspection.

For disassembly and inspection during any plant mode on a regular recurring schedule, if the licensee (1) follows the appropriate guidance referenced and conditions discussed, and (2) determines that the activity can be performed in a manner that does not increase the risk to the plant, the alternative schedule is authorized pursuant to 10 CFR 50.55a(a)(3)(i) based on the activity ensuring an acceptable level of quality and safety. However, if the activity indicates a degraded valve, the licensee may be required to take a redundant train out of service, rendering an entire system inoperable, possibly requiring a plant shutdown. Such a condition must also be considered in determining the acceptability of performing the activity during power operation rather than during plant shutdown. The proposal to examine the remaining valves in the affected group "at the next available system outage" (PV-13) or "expeditiously, but with regard for effect on operating systems" (PV-14) or "during the same system or refuel outage" (PV-18) or "if necessary" (PV-29) where a degraded valve has been identified is not acceptable. Corrective actions must be taken as discussed in Section 3.5, and a maximum

time period must be determined based on the identification of degradation and assessment of the cause.

3.7 Relief Request PV-30

The licensee requests relief from the check valve exercise requirements of IWV-3521 and IWC-3522 for class 2 check valves 63-514, and 63-516 because of test impracticality. TVA proposes testing in accordance with the guidance provided in GL 89-04, Position 2. Also, TVA will exercise the valves to the open position during quarterly pump testing.

3.7.1 Basis for Relief

The licensee states:

> The standby liquid control system pumps are positive displacement pumps which by their design prohibit backflow through the pump. There exists no flow path by which the backseating capability of these check valves can be demonstrated either during system operation or plant shutdown. Nonintrusive testing has been evaluated and determined to be impractical due to limitations associated with the system configuration and test equipment. The system piping is stainless steel and will not allow ultrasonic detection of disc position with the test equipment. Use of ultrasonic flowmeters is not practical due to the numerous changes in pipe direction and size. The positive displacement pumps produce noise and vibration from the pulsating discharge which makes it difficult if not impossible to detect valve closure using acoustics. Radiography is not considered practical due to a review of test shots on other lift check valves of similar size and material. The radiographs that were reviewed did not reveal sufficient detail to determine whether the valve pistons were completely seated. Test equipment for detecting disc position using magnetics has not been purchased and was therefore unavailable for use in determining feasibility. Since these valves are stainless steel, the system utilizes demineralized water, and the pumps are operated quarterly, there is virtually no chance of the valves becoming stuck in the open position. The inspection history of the valves bears this out. The Unit 3 valves, which have been in lay-up for almost ten years, looked the same as the Unit 2 valves during inspections performed in preparation for Unit 3 startup. During the Unit 2 refueling outage inspections conducted on these valves, there has been no cleanup or other corrective actions required.

3.7.2 Alternative Testing

The licensee proposes:

> These valves will be grouped according to design [manufacturer, size, model number, and materials of construction] and service conditions. One check valve will be disassembled at each

refueling outage on a rotational basis in accordance with Position 2 of NRC Generic Letter 89-04. Should the disassembled valve fail to function properly, the other valve will also be disassembled and examined during the same refueling outage. Because there are only two of these valves per unit, each valve will be disassembled at least once every other refueling outage. These valves will be exercised to the open position during quarterly pump testing. The design of these check valves results in less chance of problems caused by disassembly and reassembly. Because the piston is positioned down inside the valve body until forced open by water pressure, there is virtually no chance of kinking the piston in the valve cylinder when reinstalling the valve bonnet. The inspection and cleaning (as necessary) of the valve internals after disassembly ensures that the valve piston is free to move when it is reassembled.

3.7.3 Evaluation

The Code requires a full-stroke exercise of certain safety-related check valves quarterly, if practical, and provides a hierarchy for part-stroke and full-stroke exercising quarterly, during cold shutdowns, or during refueling outages if quarterly full-stroke exercising is impractical. The licensee proposes to disassemble and inspect the standby liquid control pump discharge check valves 63-514 and 516 on a sampling basis such that each valve is disassembled and inspected every other refueling outage.

Since it is impractical or unusually difficult to meet the exercise requirements of IWV-3522 (or paragraph 4.3.2 of OM Part 10), the licensee's proposal to disassemble and inspect the valves may be the only practical method to verify the full-stroke capability of the valves. The proposed method conforms with guidance in GL 89-04, Position 2, and is permitted by OM-10, paragraph 4.3.2.4(c).

3.7.4 Conclusion

Based on the determination that (1) compliance with the exercising requirements of the Code is impractical and burdensome, and (2) considering that sample disassembly and inspection is an acceptable alternative according to GL 89-04, Position 2, relief is granted pursuant to 10 CFR 50.55a(f)(6)(i) to verify the capability of the valves to stroke by disassembly and inspection. Also, TVA will exercise the valves to the open position during quarterly pump testing as a complement to disassembly and inspection. The implementation of the guidance in GL 89-04, Position 2 is subject to inspection.

3.8 Relief Request PV-21

The licensee requests relief from the flow control valve and check valve exercise requirements of IWV-3411, IWV-3413, IWV-3521 and IWC-3522 for class 1 (FCV-85-39A, FCV-85-39B, and CKV-85-597) flow control valves and class 2 (CKV-85-589 and CKV-85-616) check valves because of test impracticality. TVA

proposes testing in accordance with the guidance provided in GL 89-04, Position 7.

3.8.1 Basis for Relief

The licensee states:

> These valves located on the hydraulic control units for the 185 control rod drives function on a reactor scram signal from the reactor protection system to insert the control rods rapidly into the reactor core. Cycling these valves requires scramming a control rod. There are 185 control rods in the reactor. Scramming every rod once every three months is not practical for the following reasons:
>
> a. A power reduction is required to test the scram function. Reducing power for the length of time required to scram 185 rods is not practical.
>
> b. Fuel preconditioning must follow this power reduction to avoid possible fuel damage. The longer the reduction in power, the longer the preconditioning.
>
> Their proper functioning is most practically verified by an actual scram test (except for the closure of 85-589).

3.8.2 Alternative Testing

The licensee proposes:

> Scram testing and rod insertion timing will be performed in accordance with Technical Specifications Section 4.3.C (at reactor coolant pressure 800 psig) for:
>
> a. All control rods prior to THERMAL POWER exceeding 40 percent after each refueling outage.
>
> b. 10 percent on a rotating basis at least once every 16 weeks.
>
> Valve 85-589 will be proven to close by pressure decay testing once per refueling outage.
>
> This testing is in accordance with NRC Generic Letter 89-04, Position 7.

3.8.3 Evaluation

The licensee indicates that testing could result in the rapid insertion of one or more control rods. The rod scram test frequency identified in the facility TS may be used as the valve testing frequency to minimize rapid reactivity transients and wear of the control rod drive mechanisms. This alternate test frequency must be clearly stated and documented in the IST program. The

licensee indicated that they would comply with the provisions of Position 7, of GL 89-04. Therefore, in Position 7, the staff has already determined that compliance with the Code requirements is impractical, and relief pursuant to 10 CFR 50.55a (f)(6)(i) is granted. The implementation of the guidance in GL 89-04, Position 7 is subject to further review and inspection.

4.0 IST PROGRAM REVISIONS

TVA submitted editorial changes, additions and deletions of components to the component listing tables of the IST program. These changes were not reviewed.

5.0 IST PROGRAM ANOMALIES

Anomalies 6 and 10 involve the use of nonintrusive (e.g., acoustic, ultrasonic, magnetic, radiography, and thermography) techniques to verify the full-stroke exercise capability of check valves for relief request PV-13, 14, 18, 29, and 30. TVA has determined the use of nonintrusive techniques to be impracticable. The technique using magnetics was not evaluated by TVA. The licensee did not mention past, present or future evaluation of the thermography technique. These techniques are not widely used, but improvements might make them viable options for future consideration. This addresses our request to consider the use of nonintrusive techniques.

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