ENCLOSURE 2

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TECHNICAL EVALUATION REPORT
PUMP AND VALVE INSERVICE TESTING PROGRAM
INDIAN POINT 3 NUCLEAR POWER PLANT

Docket No. 50-286

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ABSTRACT

This report presents the results of our evaluation of relief requests for the inservice testing program for safety-related pumps and valves at Indian Point 3 Nuclear Power Plant.

PREFACE

This report is 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 Indian Point 3 Nuclear Power Plant submitted by the New York Power Authority (the Authority).

Section 2 presents the Authority's bases for requesting relief from the requirements for pumps followed by an evaluation and conclusion. Section 3 presents similar information for valves.

Appendix A lists piping and instrument diagrams (P&IDs) used during this review.

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

1.1 IST Program Description

The Authority submitted the Indian Point 3 Nuclear Power Plant, pump and valve IST program with a letter dated January 17, 1990. This program covers the second ten year IST interval, which runs from August 31, 1987 to August 31, 1997. The relief requests pertain to requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (the Code), Section XI, 1983 Edition through Summer 1983 Addenda, and the Code of Federal Regulations (CFR), 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 Authority 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 and the cold shutdown justifications submitted with the licensee's IST program. Other portions of the program, such as general discussions, pump and valve test tables, etc., are not necessarily reviewed. Endorsement of these aspects of the program by the reviewer 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 according to 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.

The Authority provided several cold shutdown justifications for exercising Category A, B, and C valves during cold shutdowns and refueling outages instead of quarterly. Valves identified to be tested during cold shutdowns need not be tested if testing was performed within three months of the cold shutdown. These justifications were reviewed and found to be acceptable except as noted in Appendix B.

2. PUMP TESTING PROGRAM

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

2.1 Various Pumps in the IST Program

2.1.1 Full-Scale Range and Accuracy of Pressure Instruments

2.1.1.1 Relief Request. PR-13 requests relief from the suction pressure instrument full-scale range and accuracy requirements of the Code, Paragraph IWP-4120, for the following pumps. The licensee proposes that if the Code instrument range and accuracy requirements are not met the installed instruments will be accurate to at least ±0.5 psi. If differential pressure is calculated, the calculated value will be accurate to ±2% of the differential pressure value.

Pump Description
Residual Heat Removal (RHR) Pumps 31 and 32
Containment Spray Pumps 31 and 32
Safety Injection (SI) Pumps 31, 32, and 33
Auxiliary Component Cooling Pumps 31 through 34
Component Cooling Pumps 31 through 33

2.1.1.1.1 Licensee's Basis for Requesting Relief--The installed suction pressure gauge of a pump is generally sized to accommodate the maximum pressure it would experience under normal or emergency conditions. In many cases, this results in an instrument range that exceeds the Code requirement since, under test conditions, high suction pressures are typically not experienced. Strict Code compliance would require the installation of temporary gauges that would not be suitable for routine or emergency pump operation.

Suction pressure measurements serve two primary functions. First, they provide assurance that the pump has an adequate suction head for proper operation. Secondly, the suction pressure is used to determine the pump differential pressure. For the determination of suction head, the accuracy and range requirement is overly restrictive. Since, in most cases, plant pumps are provided with a considerable margin of suction head, accuracy on the order of 0.5 and 0.75 psig should be adequate. When used in determining pump differential pressure, the accuracy of the suction pressure measurement has little or no effect on the calculation since, generally, the pump discharge pressure is higher than the suction pressure by 2 or 3 orders of magnitude.

Alternate Testing: When measuring the suction pressure of a pump, in lieu of meeting the instrument range requirement of IWP-4120, instruments may be installed such that the accuracy meets the requirements set forth below:

- Accuracy will be at least ±0.5 psi

- The accuracy of the differential pressure calculation will be limited to ±2% of the differential pressure calculated value.

2.1.1.1.2 Evaluation--The licensee proposes to comply with the Code range and accuracy requirements for measuring suction pressure or to use instruments accurate to ±0.5 psi for measuring suction pressure for the previously listed pumps. The licensee also proposes that if pump differential pressure is calculated the calculated value will be within ±2% of the differential pressure value.

For some pumps the full-scale range of the installed suction pressure gage might exceed three times the test reference value for dynamic inlet pressure. This is because the normal pump inlet pressure is low compared to what the pumps sees during other plant modes. For instance, an RHR pump may see a suction pressure of about 20 to 30 psig during power operation and see 300 psig during cold shutdown. Installing a gage with a higher range would prevent over-ranging and damage to the instrument when the inlet pressure is much higher, such as during cold shutdown.

The licensee did not identify the suction pressures for the pumps in question. However, the proposed instrument accuracy of ±0.5 psi is equivalent to the Code, ±2%, for pumps with suction pressure reference values equal to or greater than 25 psi (25 psi x 2% = 0.5 psi). For pumps with reference values lower than 25 psi, the licensee's proposal may not be equivalent the Code. However, requiring the licensee to install instruments more accurate than ±0.5 psi for these pumps with would likely be a hardship without a compensating increase in quality. For those cases, the licensee should ensure that the instruments are sufficiently accurate to determine (considering worst case inaccuracies) whether adequate net positive suction head (NPSH) is available for pump operation.

The licensee also proposes to calculate pump differential pressure for some of these pumps. That calculation will be accurate to at least ±2% of the actual differential pressure value. The licensee's proposal is equivalent to, and in most cases more conservative than the Code requirement. The licensee's proposal should not adversely affect plant safety. The proposed method provides sufficiently accurate data for assessing pump degradation, and provides an acceptable level of quality and safety.

Based on the determination that the licensee's proposal provides an acceptable level of quality and safety, relief should be granted provided the licensee ensures that the instruments used to measure suction pressure are sufficiently accurate to determine whether adequate NPSH is available for pump operation.

2.2 Recirculation System

2.2.1 Relief Request. PR-12 requests relief from the test frequency and from measuring flow rate and differential pressure according to Code, Paragraph IWP-3100, for the recirculation sump pumps, 31 and 32. The licensee proposes to measure and evaluate the pump discharge pressure and vibration during pump testing. No test frequency is specified.

2.2.1.1 Licensee's Basis for Requesting Relief--The normal test loop for these pumps is from the containment sump and return via the individual minimum flow piping and the common minimum flow line. There is no flow instrumentation installed in the flow loop that could provide the capability of obtaining the required flow rate measurement. It should be noted that these lines are constructed of 3/4-inch piping that are capable of passing only a small fraction of the rate of flow of these pumps. Thus, any flow rate measurements would be of little value in identifying any pump degradation. During the testing, pump discharge pressure and vibration are measured and evaluated. These parameters will provide adequate indication of pump degradation. Further, since these pumps stand idle and dry except [illegible] periods of testing, significant inservice degradation is unlikely.

Alternate Testing: Whenever these pumps are tested, pump discharge pressure and vibration will be measured and evaluated.

2.2.1.2 Evaluation--These pumps do not have installed instruments or other installed provisions for measuring their flow rate or differential pressure during testing. The safety function flow path is from the containment sump through the RHR heat exchangers and to the containment spray headers. Flow through this path would spray into the containment and could cause damage to lagging, piping and other equipment. The only flow path available for testing is a small diameter mini-flow line without a flow rate measuring instrument. Significant system redesign and modification, such as installing a larger diameter test loop, is needed to test the pumps under significant or full flow conditions while measuring all Code specified parameters. This modification would be costly and burdensome.

It is difficult to detect changes in pump condition measuring only discharge pressure and vibration, as proposed. Both these parameters can be affected greatly by variations in suction pressure, which in this case is due to the liquid level in the recirculation sump. GL 89-04, Position 9, specifies measurement of differential pressure and vibration. The level in the sump above the pump suction can be used to determine suction pressure. This in turn can be used with discharge pressure to determine differential pressure.

Also, it might be practical to route the return line flow to a graduated container during pump operation to determine the flow rate. Calculating the flow rate to the accuracy required by the Code for flow rate measurements ($\pm$2%) could be a reasonable alternative to the Code requirement. GL 89-04, Position 9, provides guidance on the use of instruments where only the mini-flow return line is available for pump testing. The stated position is that flow rate instruments, which meet the requirements of IWP-4110 and 4120, must be installed in the mini-flow return line. Pump flow rate is needed so the data can be evaluated with differential pressure to monitor pump hydraulic degradation.

GL 89-04, Position 9, also stipulates that differential pressure and vibration be measured during quarterly testing. However, quarterly testing does not appear to be feasible for these pumps since their suction is normally dry and they are inaccessible, inside of the containment. The relief request did not indicate the test interval for these pumps, but the licensee's program

pump table shows that the recirculation pumps would be tested at each refueling outage. It should be noted that the likelihood of many types of inservice degradation is reduced since these pumps are idle and dry except during testing. Therefore, testing these pumps during each refueling outage should be a reasonable alternative to the Code frequency.

The licensee's proposal to measure and evaluate pump discharge pressure and vibration gives some information to evaluate and detect pump degradation. This proposed testing allows an adequate assessment of operational readiness and reasonable alternative to the Code test method requirements for an interim period of one year or until the next refueling outage, whichever is longer, provided the proposed testing is done at least each refueling outage. However, the proposal might not provide a reasonable long term alternative and long term relief is not shown to be justified.

Based on the determination that compliance with the Code requirements is impracticable and burdensome, and considering the licensee's proposal, interim relief should be granted for one year or until the next refueling outage, whichever is longer, while the licensee investigates acceptable alternatives. During the interim period, these pumps should be tested as proposed if a refueling outage occurs.

3. 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.

3.1 Boiler Feedwater System

3.1.1 Category B Valves

3.1.1.1 Relief Request. VR-29 requests relief from the stroke timing requirements of the Code, Paragraph IWV-3413(b), for boiler feedwater valves FCV-405A through -405D and FCV-406A through -406D. The licensee proposes to exercise these valves and observe the stroke to ensure the valves operate correctly in response to the positioning signal.

3.1.1.1.1 Licensee's Basis for Requesting Relief--These valves are flow control modulating valves, therefore valve stroke time measurements are not practical nor are they significant in evaluating their capability to perform their safety functions. Due to the type of position control system installed, it is impractical and of questionable value to attempt to accurately measure stroke time.

Alternate Testing: These valves will be full-stroke exercised with a local observer to ensure the valves operate properly, smoothly, and with proper response to the positioning signal.

3.1.1.1.2 Evaluation--These valves modulate the flow from the auxiliary feedwater (AFW) pumps to the steam generators. The licensee proposes to observe the operation of these valves in response to the positioning signal in lieu of stroke timing. However, there is no criteria specified for determining acceptable or unacceptable performance. The recognition of a change in performance characteristics or an adverse trend relies solely on the subjective judgement of the individual viewing valve operation. Acceptance criteria should be clearly established to ensure that the performance trending and evaluation results are meaningful. The quantification of an adverse trend needs to be based on changes from reference values compared with appropriate acceptance criteria. The proposal does not adequately assess the condition of these valves to support the determination of operational readiness as required by the Code. Therefore, long term relief should not be granted. Some method of accurately stroke timing or otherwise evaluating the valve condition is necessary for determining their operational readiness.

The licensee should pursue alternate methods of stroke time testing the valves or otherwise adequately assessing their condition as required by the Code. Methods employing magnetics, acoustics, ultrasonics, or other technologies should be investigated for their suitability. The proposal to exercise these valves and verify their position quarterly gets some information about valve condition and should be acceptable on an interim

basis. But, it does not adequately evaluate valve condition and does not present a reasonable long term alternative to the Code requirements.

Based on the determination that complying with the Code requirements is impractical and considering the licensee's proposal interim relief should be granted for a period of one year or until the next refueling outage, whichever date is longer. During this period, the licensee should develop a method of measuring the stroke times or some other means to adequately monitor the condition of these valves.

3.1.2 Category C Valves

3.1.2.1 Relief Request. VR-5 requests relief from the test frequency requirements of the Code, Paragraph IWV-3521, for exercising the turbine-driven AFW pump individual discharge check valves, BFD 47-1 through 47-4 and the common discharge check valve, BFD-31. The licensee proposes to verify closure of valves BFD 47-1 through 47-4 during each cold shutdown in which the temperature conditions of the steam generators permit operation of the motor-driven AFW pumps. The licensee also proposes to full-stroke exercise all these valves open and closed during each reactor refueling outage.

3.1.2.1.1 Licensee's Basis for Requesting Relief--During power operation, exercising these valves would require operating the steam-driven AFW pump and injection of cold water into the steam generators. This could result in thermal shock to the feedwater supply piping and the steam generator nozzles which is highly undesirable. During a normal cold shutdown period steam is not available for operation of the steam-driven AFW pump. Thus, since operation of this pump is the only practical way of exercising these valves, cold shutdown testing is impractical. Verifying closure of these valves requires the operation of at least one of the motor-driven AFW pumps with injection to the steam generators. As discussed above, this is not practical during normal plant operation at power. Furthermore, it may not be practical during cold shutdown when steam generator metal temperatures are elevated and thermal shock remains a concern.

Alternate Testing: During cold shutdown periods, valves BFD 47-1 through BFD 47-4 will be verified to be closed if operation of the motor-driven AFW pumps is permitted by the temperature conditions of the steam generators. During each reactor refueling outage these valves will be full-stroke exercised in the open and closed directions, as required.

3.1.2.1.2 Evaluation--All of these valves open to provide a flow path from the discharge of the turbine-driven AFW pump to the steam generators. These valves are not equipped with external position indication or operators. Exercising them open is impracticable quarterly during normal power operation or at each cold shutdown. The open exercise results in the injection of relatively cold feedwater into the hot feedwater lines and into the steam generators. The generators must be hot to provide steam to operate the turbine-driven AFW pump and there is no other source of steam available to the turbine at any time. However, injection of the cold water could cause thermal shock and subsequent damage to the main feedwater lines and steam generator nozzles and should be minimized. Significant system redesign and modification is needed to allow testing at the Code frequency. This

modification would be costly and burdensome. The licensee's proposal to full-stroke exercise these valves open each reactor refueling outage helps to minimize damage to the nozzles and piping and allows an adequate assessment of operational readiness and provides a reasonable alternative to the Code.

Check valves BFD 47-1 through 47-4 close in pairs to prevent backflow through the turbine-driven AFW pump when either of the motor-driven AFW pumps is operating; valves BFD 47-1 and 47-2 close for pump No. 33 and BFD 47-3 and 47-4 close for pump No. 31. Closure testing requires a reverse differential pressure across the valves. That test can be done using the pressure developed by operating the motor-driven AFW pumps or by using installed isolation valves and test taps. The system reconfiguration and hooking-up and disconnecting of a test rig to verify closure of each of these valves during cold shutdown would likely result in a delay in the return to power, which would be costly and burdensome to the licensee. Operating the motor-driven AFW pumps during cold shutdowns when the steam generator temperatures are high could result in significant damage to the piping and nozzles. Therefore, the licensee's proposal to verify closure of valves BFD 47-1 through 47-4 during cold shutdowns when the steam generator temperature conditions permit and each refueling outage, along with valve BFD-31, allows an adequate assessment of operational readiness and provides a reasonable alternative to the Code.

Based on the determination that complying with the Code requirements is impracticable and burdensome, and that the licensee's proposal provides a reasonable alternative to the Code frequency, relief should be granted as requested.

3.2 Safety Injection System

3.2.1 Category A/C Valves

3.2.1.1 Relief Request. VR-11 requests relief from the closed test frequency requirements of the Code, Paragraph IWV-3521, for exercising the RHR and low head safety injection (LHSI) cold leg injection check valves, 838A through 838D. The licensee proposes to full-stroke exercise and leak rate test the valves at least once every two years.

3.2.1.1.1 Licensee's Basis for Requesting Relief--The only positive means of verifying valve closure is to perform a leakage test, which is impractical during plant operation or a short-duration outage.

Alternate Testing: At least once every two years these valves will be exercised and leakage tests performed to verify closure.

3.2.1.1.2 Evaluation--These valves open for LHSI injection and RHR cooling and close for reactor coolant system (RCS) pressure isolation. They cannot be full or part-stroke exercised open during power operation because the only flow path through them is into the RCS. Their supply, the low head SI pumps, cannot overcome normal operating RCS pressure to establish flow during the quarterly test. The licensee proposes to full-stroke exercise these valves with flow each cold shutdown. Full-stroke exercising these valves open each cold shutdown according to the Code test method requirements

allows an adequate assessment of operational readiness and meets the Code test frequency requirements for exercising the valves open.

Reverse flow closure or leak rate testing these valves at power is impractical as these valves and their test taps are located inside containment. Containment entry is restricted for personnel safety during power operations due to the high radiation levels and other hazards. Leak rate testing these valves during each cold shutdown is impractical because of the time required for setting up and disconnecting test equipment and performing the test. Leak rate testing each cold shutdown would likely delay reactor startup, which would be costly and burdensome. The licensee's proposal to exercise and leak rate test these valves closed at least once every two years allows an adequate assessment of operational readiness and is a reasonable alternative to the Code test frequency requirements for that test.

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

3.2.1.2 Relief Request. VR-16 requests relief from the test method and frequency requirements of the Code, Paragraph IWV-3520, for SI accumulator discharge check valves, 895A through 895D. The licensee proposes to part-stroke exercise open and leak rate test each valve during each refueling outage. In addition, one of these valves will be disassembled and inspected on a sampling basis each refueling outage.

3.2.1.2.1 Licensee's Basis for Requesting Relief--Exercising these valves to the open position requires actuation of SI and overcoming the pressure of the RCS. This cannot be done during normal plant operation since the maximum accumulator pressure is considerably less than that of the RCS.

Testing during cold shutdown - initiating SI presents a potential safety hazard due to the possibility of causing cold overpressurization of the RCS. Full-stroke testing of these valves by disassembly and inspection during a refueling outage is a major evolution requiring draining the reactor vessel and (mid-loop operation) or defueling. This results in a considerable impact on the outage schedule for little or no apparent gain in either plant safety or reliability. The only practical means of verifying valve closure is by performing a leak rate test which is not generally practical during a short-duration outage. These valves are seldom operated, therefore, valve degradation as a result of wear or abuse is not likely. A partial-stroke test followed by a leak rate test adequately ensures that a valve of this type is intact and functioning properly. Any significant deterioration of the valve internals will be discovered during a leak test. During the Spring, 1987 refueling outage, all four of these valves were disassembled, manually exercised, and inspected internally. All were found to be in good condition and fully operable. Again during the Spring, 1989 outage valve 895C was disassembled, manually exercised, and inspected internally. It was again found to be in good condition and fully operable.

Alternate Testing: During each refueling outage each valve will be part-stroke tested followed by a leakage test. During each reactor refueling

outage, one of these valves will be disassembled, inspected, and manually exercised to verify operability. The schedule will be rotated such that all valves are inspected in sequence. During these inspections, should a disassembled valve prove to be inoperable (i.e., incapable of performing its safety function), then, during the same outage, the remainder of the subject valves will be disassembled, inspected, and exercised to verify operability.

3.2.1.2.2 Evaluation--These valves open to allow a high rate of flow from the SI accumulator tanks into the RCS. They close to prevent the loss of RCS inventory into the accumulator tanks if the associated 897 valve (897A-D) should leak. These valves cannot be full- or part-stroke exercised open during power operation because the only flow path is into the RCS. The lower pressure of the accumulators cannot overcome normal operating RCS pressure to initiate flow. It is impractical to full- or part-stroke exercise these valves open during cold shutdowns because the RCS does not contain sufficient expansion volume to accommodate the flow required. An RCS LTOP condition could occur even if less than design accident flow rates were used. Because of this concern it is impractical to full-stroke exercise these valves open during cold shutdowns.

Verifying maximum required accident flow through one of these valves during refueling outages, when the vessel head is removed to provide an adequate expansion volume, is also not practical. It would involve discharging the SI accumulators into the RCS at a very high rate, which could result in possible damage to reactor and core and other internal components. Overflow or spray from the refueling cavity could cause radioactive contamination of equipment inside containment. A non-intrusive method of testing these valves to verify their full-stroke capability might be feasible and should be considered. The use of valve diagnostics to determine that a check valve opens fully or sufficiently to pass maximum required accident flow at a relatively low flow rate can be an acceptable alternative to full flow testing.

The licensee proposes to perform sample disassembly and inspection on these check valves. Disassembly and inspection, to verify the full-stroke open capability of check valves, is an option only where such exercising cannot practically be performed by flow or by other positive means. 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. Check valve disassembly is a valuable maintenance tool that can provide much information about a valve's internal condition and, as such, should be performed under the plant maintenance program at a frequency commensurate with the valve type and service. The minutes of the public meeting on GL 89-04 stated that part-stroke exercise testing with flow should be performed after disassembly and inspection is completed but before returning the valve to service. This testing provides a degree of confidence that the disassembled valve has been re-assembled properly and that the disk moves freely. Disassembly and inspection should be done per the guidelines of GL 89-04, Position 2. Any deviations from the generic letter position should be identified and justified in a relief request.

Reverse flow closure, or leak testing, these valves requires establishing a reverse differential pressure across the valve. At power this is impractical because these valves and their test connections are located inside containment. Containment entry is restricted due to the high radiation levels and other personnel safety hazards. Plus, there are no provisions for performing this test remotely. The proposal to leak rate test these valves after a part-stroke exercise each refueling outage allows an adequate assessment of operational readiness and provides a reasonable alternative to the Code test frequency for closure.

The proposed inspection interval for these valves is greater than that identified in GL 89-04, Position 2. The licensee proposes to disassemble one of the four valves on a sampling basis during each refueling outage (in addition to the part-stroke exercise and leak test). The schedule will be rotated such that all valves are inspected in sequence over four successive refueling outages. The nominal fuel cycle length for the plant is two years. Therefore, under the proposed test schedule each valve would be disassembled at least once per 8 years, instead of once per 6 years according to GL 89-04, Position 2. That position provides guidance on extending the sampling interval for disassembly and inspection of check valves. The licensee need not provide all the information identified in Position 2 in a relief request. However, that material should be available at the facility for inspection.

The information provided in the relief request indicates that these valves have experienced very little degradation and appear, from that perspective, to be good candidates for an extended interval. However, it should be noted that, as stated in Position 2, any extension of the interval should be considered only in cases of extreme hardship. The licensee's proposal allows an adequate assessment of operational readiness and provides a reasonable alternative to the Code, provided that if the interval between disassembly and inspection is lengthened as proposed it is done according to the provisions in GL 89-04, Position 2.

Based on the determination that compliance with the Code requirements is impractical and burdensome, and considering the proposed alternate testing and frequency, relief should be granted provided disassembly and inspection is done according to the guidelines of GL 89-04, Position 2. Further, if the interval between disassembly and inspection is lengthened, the information justifying that extension should be prepared according to the provisions in GL 89-04, Position 2, and be available for inspection. The licensee should also investigate the use of non-intrusive diagnostic techniques for testing these valves.

3.2.1.3 Relief Request. VR-17 requests relief from the test method and frequency requirements of the Code, Paragraph IWV-3520, for SI combined cold leg injection valves, 897A through 897D. These valves open to supply makeup from the RHR/low head SI (LHSI) pumps or from the SI accumulators to the RCS cold legs. They close to isolate these components from RCS pressure during normal plant operation. The licensee proposes to part-stroke exercise them open during cold shutdowns and refueling outages and to leak test them during refueling outages to verify closure. In addition, during each refueling outage one valve will be disassembled, inspected, and manually exercised.

3.2.1.3.1 Licensee's Basis for Requesting Relief--Neither the RHR/LHSI pumps nor the SI accumulators can provide enough pressure to overcome RCS pressure; thus, exercising these valves during plant operation is not possible. Initiating SI by means of the SIS accumulators presents a potential safety hazard during a cold shutdown, due to the chance of causing cold over-pressurization of the RCS. The only practical means of verifying valve closure is by performing a leak rate test which is not generally practical during a short-duration outage.

Full-stroke testing of these valves by disassembly and inspection during a refueling outage is a major evolution requiring draining the reactor vessel and (mid-loop operation) or defueling. This results in a considerable impact on the outage schedule for little or not apparent gain in either plant safety or reliability. A part-stroke test followed by a leak rate test adequately ensures that a valve of this type is intact and functioning properly. Any significant deterioration of the valve internals will likely be discovered during a leak test. During the Spring 1989 outage, valve 897C was disassembled, manually exercised, and inspected internally. It was again found to be in good condition and fully operable.

Alternate Testing: During cold shutdown, these valves will be part-stroke exercised to the open position pursuant to the requirements of the Code, Section XI, Paragraph IWV-3522. During each refueling outage these valves will be part-stroke exercised and a leakage test performed to verify closure. Note that part-stroke refers to the flow required by injection via the SIS accumulators; the valves are actually full-flow tested with respect to the RHR/low head injection pumps.

During each reactor refueling outage, one of these valves will be disassembled, inspected, and manually exercised to verify operability. The schedule will be rotated such that all valves are inspected in sequence. During these inspections, should a disassembled valve prove to be inoperable (i.e., incapable of performing its safety function), then, during the same outage, the remainder of the subject valves will be disassembled, inspected, and exercised to verify operability.

3.2.1.3.2 Evaluation--These valves open to allow very high flow rates from the SI accumulator tanks or lesser flow rates from LHSI or HHSI into the RCS. They close to form part of the RCS pressure boundary. During power operation, these valves cannot be full- or part-stroke exercised open because the only flow path through them is into the RCS. Their supply sources cannot produce a pressure greater than normal operating RCS pressure to establish flow into the RCS. During cold shutdowns and refueling outages, it is impractical to pass the maximum required accident flow rate through these valves, which is that flow rate provided by the accumulators. During RHR operations at cold shutdown these valves receive a significant part-stroke exercise. It might be possible to use non-intrusive techniques to show that these valves are full-stroke exercised open during RHR operations at cold shutdown.

Verifying maximum required accident flow through each of these valves during refueling outages, when the vessel head is removed to provide an adequate expansion volume, is not practical. It would involve discharging the

SI accumulators into the RCS at a very high rate, which could result in possible damage to reactor and core and other internal components. Overflow or spray from the refueling cavity could cause radioactive contamination of equipment inside containment. A non-intrusive method of testing these valves to verify their full-stroke capability might be feasible. The use of valve diagnostics to determine that a check valve opens fully or sufficiently to pass maximum required accident flow at a relatively low flow rate can be an acceptable alternative to full flow testing. The licensee should investigate the use of non-intrusive diagnostic techniques to verify that the valves full-stroke open when subjected to flow from a source, such as a reduced pressure accumulator or RHR, during cold shutdowns or refueling outages.

The licensee proposes to perform sample disassembly and inspection on these check valves. Disassembly and inspection, to verify the full-stroke open capability of check valves, is an option only where such exercising cannot practically be performed by flow or by other positive means. See Section 3.2.1.2.2 of this report for additional discussion of disassembly and inspection. Disassembly and inspection should be done per the guidelines of GL 89-04, Position 2. Any deviations from the generic letter position should be identified and justified in a relief request.

The proposed inspection interval for these valves is greater than that identified in GL 89-04, Position 2. See Section 3.2.1.2.2 of this report for additional discussion on extending the interval between disassembly and inspection. These valves might be good candidates for an extended interval. However, as stated in Position 2, any extension of the interval should be considered only in cases of extreme hardship. The licensee's proposal for exercising these valves open and inspecting them allows an adequate assessment of operational readiness and provides a reasonable alternative to the Code provided that if the interval between disassembly and inspection is lengthened, as proposed, it is done according to the provisions in GL 89-04, Position 2.

Reverse flow closure or leak testing these valves requires the establishment of a reverse differential pressure across the valve. At power this is impractical because these valves are located inside containment and containment entry is restricted due to the high radiation levels and other personnel safety hazards. Plus, there are no provisions for performing this test remotely. The proposal to leakage test these valves after a part-stroke exercise each refueling outage allows an adequate assessment of operational readiness and provides a reasonable alternative to the Code test frequency for closure.

Based on the determination that compliance with the Code requirements is impractical and burdensome, and considering the proposed alternate testing and frequency, relief should be granted provided disassembly and inspection is done according to the guidelines of GL 89-04, Position 2. Further, if the interval between disassembly and inspection is lengthened, the information justifying that extension should be prepared according to the provisions in GL 89-04, Position 2, and be available for inspection. The licensee should also investigate the use of non-intrusive diagnostic techniques for testing these valves.

3.2.1.4 Relief Request. VR-29 requests relief from the Category A leak rate test requirements of the Code, Paragraph IWV-3420, for high head SI (HHSI) line check valves, 857A, G, Q, R, S, T, U, and W. The licensee proposes to leak test the valves in the triple valve series combinations with the resulting leak rate evaluated as if a single valve were tested.

3.2.1.4.1 Licensee's Basis for Requesting Relief--The Indian Point 3 TS, Section 4.5.B.2.C, requires leak testing of these check valves due to the potential of overpressurization of the SI system (Event V scenario). To ensure that this does not occur, and in accordance with NRC letter dated February 25, 1980, Subject: Event V Scenario, only two valves in series require testing. Due to difficulties with testing a single valve in these cases, it has been decided to test three (3) valves in series - considering the outer two as acting as a single barrier (with a single test) to the RCS pressure. This is considered to be equivalent to testing two valves in series.

Alternate Testing: These valves will be leak tested in the series combination with the resulting leak rate evaluated as if a single valve were tested.

3.2.1.4.2 Evaluation--These Category A/C RCS pressure isolation check valves are located inside primary containment. They are simple check valves not equipped with external operators or position indication. They are installed in series in the HHSI lines to the RCS cold legs. There are four series sets; 857A and G, 857Q and R, 857S and T, and 857U and W. The valve nearest to the RCS in each case sees an operating pressure differential of approximately 600 psi, or the difference between SI accumulator pressure and any residual pressure in the HHSI line. The second valve in each of these series should have no differential pressure across it.

The licensee proposes to verify the Category A seat leakage tightness of these check valves by leak testing them in series with a third valve (the cold leg injection valve) and to evaluate the measured leakage rate as that of a single valve. The NRC has approved specific requests to test series check valves in pairs, where there was no provision for leak testing the valves individually. But, leak rate testing several valves in series, to satisfy the Category A leak rate testing requirements, should be considered as an option only as a last resort or in special cases. That is because the test assesses the seating capability of only one of the series valves. According to the HHSI system print, Drawing ISI-27353, Sheet 1, Revision 1, dated March 11, 1987, this system is equipped with sufficient test taps and other provisions to leak rate test these valves individually. This is not a simple test. It is likely that it would have to be done when the plant is at or near normal operating pressure, though not necessarily during power operation. But, it appears that it is feasible to test these valves individually according to the Code Category A test method requirements each refueling outage or at least once every two years.

The NRC is authorized by law to grant relief from the Code requirements when the licensee demonstrates either that their proposed alternatives would provide an acceptable level of quality and safety, 10 CFR 50.55a(a)(3)(i), that compliance would result in hardship or unusual difficulty without a

compensating increase in the level of quality or safety (a)(3)(ii), or that the Code requirements are impractical (g)(6)(i). The proposed alternate test method, to test three Category A/C valve as one, is not shown to provide an acceptable level of quality and safety. The licensee has not shown that a significant hardship results from testing these valves individually nor demonstrated that there is not a compensating increase in safety. And lastly, whereas it may be inconvenient to test these valves individually, due to their location and other considerations, it has not been shown to be impractical. Therefore, relief should not be granted to test these valves in series as proposed.

3.2.2 Category C Valves

3.2.2.1 Relief Request. VR-14 requests relief from the test method and frequency requirements of the Code, Paragraph IWV-3520, for SI recirculation pump discharge check valves, 886A and 886B. The licensee proposes to part-stroke exercise each valve during each reactor refueling outage. In addition, during every other refueling outage one valve will be disassembled, inspected, and manually exercised.

3.2.2.1.1 Licensee's Basis for Requesting Relief--This system remains drained during all modes of operation except during refueling outages when water is provided to test the recirculation pumps. Because there is no full-flow test line, a minimal amount of water is recirculated to the sump. This flow rate is capable of only partially stroking the discharge valves. Because these valves are never operated except for pump testing each refueling and they are maintained in a dry condition, there is a low probability of deterioration.

Alternate Testing: During each reactor refueling outage each of these valves will be part-stroke exercised in conjunction with recirculation pump testing. During every other reactor refueling outage, one of these valves will be disassembled, inspected, and manually exercised to verify operability. The schedule will be rotated such that both valves are inspected at least once per six-year interval. During these inspections, should a disassembled valve prove to be inoperable (i.e., incapable of performing its safety function), then, during the same outage, the other valve will be disassembled, inspected, and exercised to verify operability.

3.2.2.1.2 Evaluation--The recirculation system is drained during all modes of operation except refueling outages when the recirculation pumps are tested. There is no available path to full flow test these check valves except into the containment spray rings. Flow through that path would spray containment and cause damage to materials and equipment inside, therefore, full flow testing is impractical at any frequency. Installing a full flow test loop would require system redesign and modification, which would be costly and burdensome. The capacity of the mini flow test line is capable only of demonstrating a part-stroke exercise of the valves. The licensee proposes to part-stroke exercise these valves each refueling outage during recirculation pump testing. This appears to be the only feasible method and frequency for testing these check valves open with flow.

The licensee also proposes to disassemble and inspect one of these valves every other refueling outage. Check valve disassembly and inspection per GL 89-04, Position 2, provides a reasonable alternative to the Code in lieu of full-stroke exercising these valves. However, it is an option only where such exercising cannot practically be performed by flow or by other positive means. See Section 3.2.1.2.2 of this report for additional discussion of disassembly and inspection. Disassembly and inspection should be done per the guidelines of GL 89-04, Position 2. Any deviations from the generic letter position should be identified and justified in a relief request.

The proposed inspection interval for these valves is greater than that identified in GL 89-04, Position 2, since during some refueling outages no valves will be disassembled. See Section 3.2.1.2.2 of this report for additional discussion on extending the interval between disassembly and inspection. These valves might be good candidates for an extended interval. However, as stated in Position 2, any extension of the interval should be considered only in cases of extreme hardship. The licensee's proposal for exercising these valves open and inspecting them allows an adequate assessment of operational readiness and provides a reasonable alternative to the Code provided that if the interval between disassembly and inspection is lengthened, as proposed, it is done according to the provisions in GL 89-04, Position 2.

Based on the determination that compliance with the Code requirements is impractical and burdensome, and considering the proposed alternate testing and frequency, relief should be granted provided disassembly and inspection is done according to the guidelines of GL 89-04, Position 2. Further, if the interval between disassembly and inspection is lengthened, the information justifying that extension should be prepared per GL 89-04, Position 2, and be available for inspection.

3.2.2.2 Relief Request. VR-19 requests relief from the test method and frequency requirements of the Code, Paragraph IWV-3520, for SI recirculation line check valve 1820. The licensee proposes to part-stroke exercise this valve each refueling outage and to disassemble and inspect it every other refueling outage.

3.2.2.2.1 Licensee's Basis for Requesting Relief--This system is normally maintained in a dry condition except during testing of the recirculation pumps which is performed during refueling outages. This precludes pump operation that is required for testing of this valve. The test circuit for testing of the recirculation pumps does not contain instrumentation for measuring flow through this valve as required by NRC GL 89-04, Position 1. Because this valve is never operated except for pump testing each refueling and it is maintained in a dry condition, there is a low probability of deterioration.

Alternate Testing: This valve will be part-stroke exercised during each refueling outage in conjunction with recirculation pump testing. During every other reactor refueling outage this valve will be disassembled, inspected, and manually exercised to verify operability.

3.2.2.2.2 Evaluation--This valve is in the recirculation system, which is drained during all modes of operation except refueling outages when the recirculation pumps are tested. There is no available path to full flow test this check valve except into the containment spray rings. Flow through that path would spray containment and cause damage to materials and equipment inside, therefore, full flow testing is impractical at any frequency. Installing a full flow test loop would require system redesign and modification, which would be costly and burdensome. The capacity of the mini flow test line is capable only of demonstrating a part-stroke exercise of this valve. The licensee proposes to part-stroke exercise this valve each refueling outage during testing of the recirculation pump. This appears to be the only feasible method and frequency for testing this check valve open with flow.

The licensee also proposes to disassemble and inspect this valve every other refueling outage. Check valve disassembly and inspection per GL 89-04, Position 2, provides a reasonable alternative to the Code in lieu of full-stroke exercising this valve. See Section 3.2.1.2.2 of this report for additional discussion of disassembly and inspection. Disassembly and inspection should be done per the guidelines of GL 89-04, Position 2. Any deviations from the generic letter position should be identified and justified in a relief request.

The proposed inspection interval for this valve is greater than that identified in GL 89-04, Position 2, since during every other refueling outage this valve will not be disassembled. See Section 3.2.1.2.2 of this report for additional discussion on extending the interval between disassembly and inspection. This valve, as well as valves 886A and 886B (discussed in Section 3.2.2.1 of this report), might be good candidates for an extended interval, given their limited exposure to many degradation mechanisms. However, as stated in Position 2, any extension of the interval should be considered only in cases of extreme hardship.

The proposal for part-stroke exercising this valve open and inspecting it during refueling outages allows an adequate assessment of operational readiness and provides a reasonable alternative to the Code provided that if the interval between disassembly and inspection is lengthened, as proposed, it is done according to the provisions in GL 89-04, Position 2.

Based on the determination that compliance with the Code requirements is impractical and burdensome, and considering the proposed alternate testing and frequency, relief should be granted provided disassembly and inspection is done according to the guidelines of GL 89-04, Position 2. Further, if the interval between disassembly and inspection is lengthened, the information justifying that extension should be prepared according to the provisions in GL 89-04, Position 2, and be available for inspection.

3.2.2.3 Relief Request. VR-24 requests relief from the test frequency requirements of the Code, Paragraph IWV-3521, for RHR pump suction from RWST check valve, 881. The licensee proposes to part-stroke exercise the valve quarterly, and full-stroke exercise it during each refueling outage.

3.2.2.3.1 Licensee's Basis for Requesting Relief--There is no full flow test circuit to provide sufficient flow needed for full-stroke exercising of this valve during normal plant operation. In cold shutdown, the RHR pumps are used for RHR and there is insufficient letdown capability to recirculate to the RWST, thus, testing this valve is not practical.

Alternate Testing: This valve will be part-stroke exercised quarterly. The subject valve will be full-stroke exercised during each refueling outage.

3.2.2.3.2 Evaluation--This valve opens to provide a pathway for water from the refueling water storage tank (RWST) to the suction of the RHR pumps. This valve is part-stroke exercised during cold shutdowns during operation of the RHR system. However, there is no full flow test circuit available to provide the flow needed to full-stroke exercise the valve during normal plant operation or cold shutdowns. Additionally, the RHR pumps cannot produce sufficient head to pump into the RCS at normal operating pressure. Full-stroke exercising this valve open with flow is also impracticable during cold shutdowns as there is not a sufficient surge volume available in the RCS to establish a flow rate equal to the maximum required safety analysis rate. The only flow path through this valve capable of passing the high flow rate needed to verify a full-stroke exercise with flow is into the RCS. During refueling outages when the reactor vessel head is removed, full flow can be achieved through this valve to verify its full-stroke capability.

The licensee proposes to part-stroke exercising this valve during cold shutdowns and to full-stroke exercise it during refueling outages. The proposed testing will allow an adequate assessment of operational readiness and provide 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 since the licensee's proposal provides a reasonable alternative to the Code, relief should be granted as requested.

3.3 Main Steam System

3.3.1 Category B Valves

3.3.1.1 Relief Request. VR-41 requests relief from the full-stroke time and test frequency requirements of the Code, Paragraphs IWV-3413(b) and IWV-3521, respectively for main steam valves HCV-1118 and PCV-1139. The licensee proposes to part-stroke exercise the valves quarterly. During each refueling outage these valves will be full-stroke exercised and observed to ensure correct operation.

3.3.1.1.1 Licensee's Basis for Relief--These valves are flow and pressure control modulating valves, therefore valve stroke time measurements are not practical nor are they significant in evaluating their capability to perform their safety functions. During power operation, full-stroke exercising these valves would require operating the steam-driven auxiliary feedwater pump and injection of cold water into the steam generators. This could result in thermal shock to the feedwater supply piping and the steam generator nozzles, which is highly undesirable. During a normal cold shutdown

period steam is not available for operation of the steam-driven auxiliary feed pump. Thus, since operation of this pump is the only practical way of full-stroke exercising these valves, cold shutdown testing is impractical.

Alternate Testing: These valves will be part-stroke exercised quarterly in conjunction with minimum flow recirculation testing of AFW pump no. 32. During each reactor refueling outage these valves will be exercised in conjunction with full-flow testing of AFW pump no. 32 with a local observer to ensure the valves operate properly, smoothly, and with proper response to the positioning signal.

3.3.1.1.2 Evaluation--These valves operate to modulate steam flow to the turbine-driven AFW pump. It is impractical to full-stroke exercise them during power operation and during cold shutdowns. During normal power operation, exercising these valves would require operating the pump and injecting cold water into the steam generators. The cold injection water could cause thermal shock to the hot feedwater supply piping and steam generator nozzles. This is a highly undesirable condition that could cause reduced reliability and lead to premature failure of these components.

The licensee proposes to part-stroke these valves quarterly in conjunction with the minimum flow recirculation test of the AFW pump. During each refueling outage these valves will be full-stroke exercised. During that exercise, in lieu of stroke timing, a local observer will ensure the valves operate properly and smoothly in response to the positioning signal. However, there is no criteria specified for determining acceptable or unacceptable performance. The recognition of a change in performance characteristics or an adverse trend in these power-operated valves relies solely on the subjective judgement of the individual viewing valve operation. Acceptance criteria should be clearly established and identified to ensure that the performance trending and evaluation of results are meaningful. The quantification of an adverse trend needs to be based on changes from reference values compared with appropriate acceptance criteria. The proposal does not adequately assess the condition of these valves to support the determination of operational readiness as required by the Code. Therefore, long term relief should not be granted. Some method of accurately stroke timing or otherwise evaluating the valve condition is necessary for determining the operational readiness of these valves.

The licensee should pursue alternate methods of stroke time testing the valves or otherwise adequately assessing their condition as required by the Code. Methods employing magnetics, acoustics, ultrasonics, or other technologies should be investigated for their suitability. The proposal to exercise these valves and verify their position quarterly gets some information about the condition of these valves and should be acceptable on an interim basis. But, it does not adequately evaluate valve condition and does not present a reasonable long term alternative to the Code requirements.

Based on the determination that complying with the Code requirements is impractical and considering the licensee's proposal, interim relief should be granted for a period of one year or until the next refueling outage, whichever is longer. During this period, the licensee should develop a method of

measuring the stroke times or some other means to adequately monitor the condition of these valves.

3.4 Various Systems

3.4.1 Category A and A/C Containment Isolation Valves

3.4.1.1 Relief Request. VR-33 requests relief from individually leak rate testing certain containment isolation valves (CIVs) according to the test method requirements of the Code, Paragraph IWV-3420. The licensee proposes to leak rate test certain CIVs in groups and compare the measured leakage rates to specified group limits.

3.4.1.1.1 Licensee's Basis for Relief--Due to the configuration of the system piping and components, in many cases measurement of individual leakage rates is impractical. In these cases it is customary to perform tests with the test volume between valves in series or behind valves in parallel paths. 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 Generic Letter 89-04)

Alternate Testing: When practical, Category A or A/C valves will be leak tested individually. In those cases where this is not the case, valves will be leaktested simultaneously in multiple valve arrangements and a maximum permissible leakage rate will be applied to each combination of valves. The corrective action as specified in Subparagraph IWV-3427(b) will not be applied to valve test results.

3.4.1.1.2 Evaluation--The licensee proposes to leak rate test, in groups, CIVs that cannot be practically tested individually. The measured leak rates will be evaluated against Owner-assigned maximum permissible limits There are many cases where it is impracticable to leak rate test valves individually. This can be due to system design constraints, such as the absence of test connections or isolation valves. System redesign and modification would be needed to allow for individual testing. This modification would be costly and burdensome to the licensee.

The Code test monitors changes in the condition of individual valves for assessing operational readiness. Where practicable, valves should be tested and evaluated individually as required, even if the valves are in groups with others that cannot be tested individually. In cases where it is impracticable to test individually, testing in groups can be acceptable. This is provided the group leakage limits are set such that excessive leakage through any valve in the group is detected. If the assigned group limit is exceeded, the group must be declared inoperable and corrective action taken before return to service.

Based on the determination that compliance with the Code requirements is impractical and burdensome, and considering the alternate proposal, relief should be granted with the following provisions. Valves that can be practicably tested only in groups may be leak tested in groups. Group leak-rate limits should be assigned, conservatively based on the smallest

valve in the group, so that corrective action will be taken whenever the leak tight integrity of any group tested valve is in question.

Testing per the Code or Appendix J and Paragraphs IWV-3426 and -3427(a), as specified in GL 89-04, Position 10, gives adequate assurance of operational readiness of CIVs 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. However, 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.

APPENDIX A

P&ID LIST

APPENDIX A

P&ID LIST

The P&IDs listed below were used during the course of this review.

System	P&ID	Revision
Auxiliary Coolant	ISI-27203	0
	ISI-27513, sheet 2	1
Boiler Feedwater	ISI-20193	1
Channel Pressurization	ISI-27263	1
Chemical Volume and Control	ISI-27363	1
Condensate and Feed	ISI-20133	1
Hydrogen Recombiner	ISI-27533	1
Instrument Air	ISI-20363	0
Isolation Valve Seal Water	ISI-27463	1
Main Steam	ISI-20173	1
Nitrogen Service to Nuclear Eqpt.	ISI-27233	2
Post Accident Sampling	ISI-26533	1
Primary Makeup	ISI-27243	0
Reactor Coolant	ISI-27383	1
	ISI-27473, sheet 2	1
Safety Injection	ISI-27353	1
	ISI-27503, sheet 2	2
Sampling	ISI-27453	2
Service Water	ISI-27223	1
Station Air	ISI-20353	1
Steam Generator Blowdown	ISI-27293	1
Waste Disposal	ISI-27193	0

APPENDIX B

IST PROGRAM ANOMALIES

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IST PROGRAM ANOMALIES

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

1. PR-1 requests relief from the Code requirement to return to specific reference values during pump testing. Subsection IWP, requires that pump flow rate and differential pressure be evaluated against reference values to monitor pump condition and allow detection of hydraulic degradation. The licensee proposes comparing differential pressure and flow rate measurements to pump "curves." This request applies to all pumps in the IST program, regardless of whether testing according to the Code is practical.

   For pumps covered by this request where it is impractical to test at a reference value of flow rate and differential pressure, testing in the "as-found" condition and comparing values to an established reference "curve" may be an acceptable alternative. Pump curves represent an infinite set of reference points of flow rate and differential pressure. Establishing a reference "curve" for a pump when it is known to be operating acceptably, and basing the acceptance criteria on this curve, can permit evaluation of pump condition and detection of degradation, though not in accordance with IWP. There is, however, a higher degree of uncertainty associated with using a curve to assess operational readiness. Therefore, the development of the reference curve should be as accurate as possible. Additionally, when using reference "curves," it may be more difficult to identify instrument drift or trend changes in component condition.

   Because it is impractical to vary the flow rate of these pumps during normal plant operating conditions, the use of a reference "curve" with acceptance criteria based on the curve is an acceptable alternative to the requirements of IWP if the following elements are incorporated into the IST program and procedures for developing and implementing the "curve(s)."

   (1) Curves are developed, or manufacturer's pump curves are validated, when the pumps are known to be operating acceptably.

   (2) The reference points used to develop or validate the curve are measured using instruments at least as accurate as required by the Code.

   (3) Curves are based on an adequate number of points, with a minimum of five.

   (4) Points are beyond the flat portion (low flow rates) of the curves in a range, which includes or is as close as practicable to design basis flow rates.

(5) Acceptance criteria based on the curves does not conflict with Technical Specifications or Facility Safety Analysis Report operability criteria, for flow rate and differential pressure, for the affected pumps.

(6) If vibration levels vary significantly over the range of pump conditions, a method for assigning appropriate vibration acceptance criteria should be developed for regions of the pump curve.

(7) When the reference curve may have been affected by repair, replacement, or routine service, a new reference curve shall be determined or the previous curve revalidated by an inservice test.

For pumps covered by this request where it is practical to test at a reference value(s) of flow rate and differential pressure, testing in the "as-found" condition and comparing values to an established reference "curve" is not an acceptable alternative. The NRC believes that the use of reference "curves" is not equivalent to testing at fixed reference values per IWP and that relief should be granted pursuant to 10 CFR 50.55a(g)(6)(i) based on the impracticality of varying the pump's operating condition in order to test at a specific point. Therefore, the licensee should revise this relief request to include only those pumps for which testing per IWP is impractical. The remaining pumps should be tested according to the Code. The licensee should respond to this concern within ninety days of receipt of this TER.

2. PR-12 (See Section 2.2.1.1 of this report) requests relief from the Code test frequency and from measuring flow rate and differential pressure for the recirculation sump pumps. The licensee proposes to measure and evaluate the pump discharge pressure and vibration during pump testing. Although the program pump table indicates that these pumps will be tested during refueling outages, no test frequency is specified in the relief request. The proposal gives some information to evaluate and detect pump degradation, but it might not provide a reasonable long term alternative to the Code. Therefore, long term relief is not shown to be justified. Interim relief should be granted for one year or until the next refueling outage, whichever is longer. During the interim period these pumps should be tested as proposed if a refueling outage occurs.

3. PR-13 (See Section 2.1.1.1 of this report) requests relief from the Code suction pressure instrument full-scale range and accuracy requirements, for several pumps. The licensee proposes that if the Code instrument range and accuracy requirements are not met, the installed instruments will be accurate to at least $\pm$0.5 psi. Also, if differential pressure is calculated, the calculated value will be accurate to $\pm$2% of the differential pressure value. Relief should be granted provided the licensee ensures that the instruments used to measure suction pressure are sufficiently accurate to determine whether adequate NPSH is available for pump operation.

4. PR-14 requests relief from increasing the frequency of testing until corrective action is taken if deviations in the pump test measurements

fall into the "Alert range." The request applies to various pumps tested monthly according to plant Technical Specifications (TS). The increased test frequency requirement of IWP-3230(a) applies only to the test intervals specified in the Code Edition and Addenda applicable to the IST program for pump testing. For Indian Point Unit 3, the applicable Code is Section XI, 1983 Edition through Summer 1983 Addenda. That Code specifies quarterly testing for pumps. Pumps with test parameter values in the "Alert Range" are required by that Code to be tested at least once each month and a half. The Code-required increased test frequency need not be applied to the TS interval (monthly) for pump testing. Therefore, biweekly testing is not required by the Code and relief need not be granted from the Code increased test frequency as requested. This request may be withdrawn.

5. VR-9 and -28 request relief from the test frequency requirements of the Code, Paragraph IWV-3521, for closure testing pump cooling supply check valves in the service water system, SWN-1-1 through SWN-1-6, and auxiliary coolant system 761A, B, and C. The licensee proposes that closure testing of these valves may be deferred. However, no maximum test interval is stated. These valves should be exercised closed as close as practicable to the Code frequency, but at least once each refueling outage. These relief requests should be revised to specify the test interval. The licensee should respond to this concern within ninety days of receipt of this TER.

6. Several relief requests evaluated in this TER (VR-14, -16, -17, and -19, evaluated in Sections 3.2.2.1, 3.2.1.2, 3.2.1.3, and 3.2.2.2, respectively), and several other others not evaluated in this TER (VR-13, -21, -22, -38, and -40) request to perform disassembly and inspection of check valves in lieu of full-stroke exercising as required by the Code. Disassembly and inspection, to verify the full-stroke open capability of check valves, is an option only where such exercising cannot practically be performed by flow or by other positive means. 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 risks, which might make its routine use as a substitute for testing undesirable when some method of testing is possible.

   Check valve disassembly is a valuable maintenance tool that can provide much information about a valve's internal condition and, as such, should be performed under the plant maintenance program at a frequency commensurate with the valve type and service. The minutes of the public meeting on GL 89-04 state that part-stroke exercising with flow should be performed before returning the valve to service. This testing provides a degree of confidence that the valve has been re-assembled properly and that the disk moves freely. Disassembly and inspection should be done per the guidelines of GL 89-04, Position 2. Any deviations from that position should be specifically identified and justified in a relief request.

Several relief requests evaluated in this TER (VR-14, -16, -17, and -19, evaluated in Sections 3.2.2.1, 3.2.1.2, 3.2.1.3, and 3.2.2.2, respectively), and another not evaluated in this TER (VR-13), request to extend the inspection interval without providing the justification called for in GL 89-04, Position 2. Position 2, provides guidance on extending the sampling interval for disassembly and inspection. The licensee needs not provide all the information identified in Position 2 in a relief request. However, the information should be developed and available at the facility for inspection. The information provided in some of the relief requests indicates that the affected valves have experienced very little degradation and appear, from that perspective, to be good candidates for an extended interval. However, as stated in Position 2, any extension of the interval from one valve in the group each refueling outage (on a rotating basis) or greater than six years for each valve should be considered only in cases of extreme hardship. The interval between disassembly and inspection should only be lengthened according to the provisions in GL 89-04, Position 2.

For some of these valves, such as the combined SI cold leg injection check valves, which receive a significant exercise during RHR operations at cold shutdowns, a non-intrusive method of testing to verify their full-stroke capability might be feasible. The use of valve diagnostics to determine that a check valve opens fully or sufficiently to pass maximum required accident flow at a relatively low flow rate can be an acceptable alternative to full flow testing. The licensee should investigate the use of non-intrusive diagnostic techniques for testing these valves.

7. VR-29 (See Section 3.2.1.4 of this report) requests relief from the Code Category A leak rate test requirements for several HHSI line check valves. The licensee proposes to leak test the valves in triple valve series combinations and to evaluate the resulting leak rate as if only a single valve was tested. Leak rate testing several valves in series, to satisfy the Category A leak rate testing requirements, should be considered as an option only as a last resort or in special cases. That test assesses the seating capability of only one of the series valves. According to the HHSI system prints, this system is equipped with sufficient provisions to leak rate test these valves individually. It appears feasible to test them according to the Code Category A test method requirements each refueling outage or at least once every two years. Relief should not be granted to test these valves in series as requested.

8. VR-30 requests relief from the increased test frequency corrective action requirements of the Code, Paragraph IWV-3417, for certain power-operated valves. These are valves that are exercised only during cold shutdown or refueling outages and that fail to meet the stroke time acceptance criteria of IWV-3417(a). The proposed alternate test frequency conflicts with the NRC staff's position on this issue. Their position is that the intent of Section XI in these cases is to determine the cause of the increased stroke time and to correct the problem prior to returning to full-power. That NRC position is consistent with the

approach taken in the OM Code 1990, Section ISTC. Therefore, general relief should not be granted from this requirement. If relief is expected to be needed for specific cases involving this class of valves, these cases should be addressed specifically in a request(s) for relief and submitted for NRC consideration. The NRC recognizes that there can be cases where the stroke time change can be found to be acceptable after a 10 CFR 50.59 evaluation. The licensee should respond to this concern within ninety days of receipt of this TER.

9 VR-33 (See Section 3.4.1.1 of this report) requests relief from individually leak rate testing containment isolation valves (CIVs) according to the test method requirements of the Code. The licensee proposes to leak rate test certain CIVs in groups with specified group leakage rate limits. Relief should be granted with the following provisions. Where practicable, valves should be tested and evaluated individually as required, even if the valves are in groups with others that cannot be tested individually. Valves that can be practicably tested only in groups may be leak tested in groups. Group leak-rate limits should be assigned, conservatively based on the smallest valve in the group, so that corrective action will be taken whenever the leak tight integrity of any group tested valve is in question.

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. Relief is granted to test the CIV function of CIVs per GL 89-04, Position 10. This relief is limited to assessing their containment isolation capability. 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 review and revise their procedures, as necessary, to be consistent with this approach.

10. VR-37 requests relief from the Code test frequency requirements for full-stroke exercising open the turbine driven auxiliary feedwater pump steam supply check valves, MS-41 and -42. The licensee proposes to full-stroke exercise these valves open on a sampling basis, one valve each refueling outage (approximately 2 years). These valves will also be part-stroke exercised open, and closed with the handwheel on a sampling basis, one valve each quarter. The proposed interval between full-stroke exercises, once every four years per valve, is excessive. That interval is not shown to be justified by information in the relief request regarding the valve's condition or its exposure to degradation mechanisms. The licensee should develop information to justify the proposed frequency for full-stroke exercising these valves or full-stroke exercise both of these valves at least each refueling outage. The licensee should respond to this concern within ninety days of receipt of this TER.

11. VR-39 and VR-41 (See Sections 3.1.1.1 and 3.3.1.1 of this report) request relief from the Code stroke timing requirements for several boiler feedwater and main steam system valves. The licensee proposes to exercise these valves and observe the stroke to ensure the valves operate correctly in response to the positioning signal. No performance acceptance criteria is specified. Recognition of a change in performance characteristics or an adverse trend relies solely on the subjective judgement of the individual viewing valve operation. Interim relief should be granted for a period of one year or until the next refueling outage, whichever is longer. During this period, the licensee should develop a method of measuring the stroke times or some other means to adequately monitor the condition of these valves.

The review performed for the TER did not include verification that all pumps and valves within the scope of 10 CFR 50.55a and Section XI are contained in the IST program. Additionally, for the components included in the IST program, no determination was made to ensure all applicable testing requirements were identified. Therefore, you are requested to provide the NRC with a description of the process used in developing the IST program. The submittal should include, as a minimum, details of the documents used, the method of determining if a component requires inservice testing, the basis for the testing required, the basis for categorizing valves, and the method or process used for maintaining the program current with design modifications or other activities performed under 10 CFR 50.59. You are requested to provide this information within 1 year of the date of this letter. This information should also be incorporated into the IST program.

The response requested by this letter affects one respondent and, therefore, is not subject to Office of Management and Budget review under P.L. 96-511.

Sincerely,

Original Signed By:
Robert A. Capra, Director
Project Directorate I-1
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Enclosures:
1. Safety Evaluation
2. TER No. EGG-NTA-10200

cc w/enclosures:
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