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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO THE INSERVICE TESTING PROGRAM REQUESTS FOR RELIEF

COMMONWEALTH EDISON COMPANY

BYRON STATION, UNITS 1 AND 2

DOCKET NOS. STN 50-454 AND STN 50-455

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) Boiler and Pressure Vessel Code (Code) Class 1, 2, and 3 pumps and valves be performed in accordance with Section XI of the ASME 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 (SE).

2.0 BACKGROUND

In a letter dated December 22, 1995, Commonwealth Edison Company (ComEd, the licensee), submitted the second ten-year interval inservice testing program for pumps and valves for Byron Station, Units 1 and 2. The submittal

included Pump Relief Request PR-1 and Valve Relief Requests VR-1, VR-2, VR-3, VR-4, VR-5, VR-6, VR-7, and VR-8.

2.1 Interval Dates

The licensee's IST program covers the second 10-year IST interval from July 1, 1996, to June 30, 2006. ComEd has placed the units on concurrent intervals by extending the Unit 1 interval and updating the program for Unit 2 approximately 1 year early. In Section 3.3.2 of NUREG-1482, the NRC recommended that licensees with two or more similar units at the same site consider placing the units on concurrent intervals to achieve consistency between the IST programs. For units with interval dates close to each other, the licensee may extend and shorten intervals in accordand with provisions in the Code within a 12-month range. Byron, Unit 1, was extended by approximately ten months, which is within the Code provisions; however, for Byron, Unit 2, the IST program is updated 13 months early. Based on the benefits that can be achieved through establishing concurrent intervals (e.g., training, common implementing procedures and programs, scheduling, similarity of requirements), and considering that the early updating of Unit 2 is only 1 month earlier than the Code would allow, placing the units on concurrent intervals will provide an acceptable level of quality and safety. NRC letter dated February 7, 1996 approved the implementation of concurrent IST intervals.

2.2 Code Edition

Byron Station, Units 1 and 2, IST program was developed in accordance with the requirements of the 1989 Edition, Section XI, of the ASME Code, Subsections IWP and IWV which references Part 6 of the ASME/ANSI Operations and Maintenance (OM) Standards for pump testing, and Part 10 of the ASME/ANSI Operations and Maintenance Standards for valve testing. The Addenda and Edition of ASME/ANSI OM Part 6 and Part 10 shall be the OMa-1988 Addenda to the OM-1987 Edition. The 1987 Edition of OM Part 1 is the appropriate edition for IST of overpressure protection devices. Note that the scope of overpressure protection devices has been expanded to include those devices that protect systems that are necessary for safe shutdown, for maintaining safe shutdown, or in mitigating the consequences of an accident, from overpressure.

3.0 RELIEF REQUESTS

The staff reviews relief requests included in inservice testing programs according to the provisions in Section 50.55a. A complete review of the program is not conducted through the review of the relief requests; however, the programs are subject to inspections which may include a sampling of the scope of the program and the application and implementation of the testing. In accordance with the regulations, an evaluation of each relief request is provided below.

3.1 Relief Request PR-1

PR-1 applies to pumps 1/2DO01PA, 1/2DO01PB, 1/2DO01PC, and 1/2DO01PD which transfer diesel fuel oil from storage tanks to the diesel generator day tanks. ASME OMa-1988, Part 6, Paragraph 5.2, requires that an inservice test be conducted with the pump operating at specified test reference conditions. NUREG-1482, Section 5.3, recommends that a total tolerance of ± 2 percent of the reference value is acceptable without approval from the NRC when the reference value can not be maintained at an "exact" value.

3.1.1 Basis for Relief

The licensee states:

> The Diesel Oil Transfer pumps are positive displacement pumps which transfer diesel oil to the diesel generator day tanks. The discharge pressure (constant for positive displacement pumps) is considered the set value for the pumps and has indicated consistent values in the past. The lowest discharge pressure reference value for a specific Diesel Oil Transfer Pump is currently 23 psig and the highest reference value is 25.5 psig. Numbers this low allow only a small tolerance for the discharge pressure when applying the ± 2 percent tolerance (as noted in NUREG-1482, Section 5.3). For instance, in considering a reference value of 23 psig, the ± % criteria allows only a ± 0.46 psig tolerance. The pressure indicators are 0-60 psig analog gauges with increments of 0.5 psig, allowing readability to the nearest 0.25 psig (readings are acceptable to a degree of precision no greater than one-half the smallest increment). To be within the ± 2 percent criteria, only a readability range of ± 0.25 psig would be possible (next higher reading of ± 0.5 psig would represent a tolerance > 2 percent). For the reference values of 25 psig or above, only a readability range of ± 0.5 psig would be possible to remain within the ± 2 percent tolerance. History indicates that there would be a few "acceptable" data points that would fall outside of these tight ranges. Byron proposes a more practical acceptable range of ± 1 psig.
>
> Discharge pressures for these positive displacement pumps are considered to be constant. There are no throttling techniques or other methods available to adjust the discharge pressure. It would be impractical to set up strict ranges of ± 2 percent due to the small magnitude of the numbers involved. In addition, the readability of the gauges is limited. History has shown acceptable pump operation for values within the ± 1 psig tolerance. The level of safety concerning the operation of these pumps will not be compromised by allowing a tolerance of ± 1 psig versus a strict ± 2 percent tolerance. Any deviations greater than 1 psig from the reference value would result in an investigation of the pump performance.

To encompass all the pumps on a consistent basis, a ± 1 psig tolerance on the discharge pressure reference value is requested, which would represent a tolerance of ± 3.9 percent to ± 4.3 percent of the existing reference values.

3.1.2 Alternative Testing

The licensee proposes:

Byron will use a discharge pressure tolerance of ± 1 psig from the reference value when testing the Diesel Oil Transfer Pumps. The flow will be compared to Table 3b of OM-6 to ensure the measured value is within the necessary acceptable limits.

3.1.3 Evaluation

The recommendation in NUREG-1482 stated that, if a tolerance of ± 2 percent was not achievable, any additional variance be justified and documented or adjustments be made to the acceptance criteria to account for the variance, depending on the precision of the instrumentation. Here, the instrument precision is such that a total variance of less than the proposed ± 1 psig is achievable; however, controlling the pressure to a value within the precision of the instrument (i.e., 0.25 psig) is impractical due to the design of the test circuit. The licensee states that there is no means to throttle the system or to adjust the discharge pressure. Therefore, with the system design, maintaining the reference value within a 2 psig range is reasonable for performing the inservice test (i.e., setting the discharge pressure within the 2 psig range and then measuring the flow). Positive displacement pumps at constant speed will not show a large variance in flow at different pressures; therefore, using the discharge pressure as the reference value, with a variance of ± 1 psig, and then measuring the flow meets the intent of the Code. The repeatability of the test provides for adequate assessment of the operational readiness of the pumps Imposing the Code requirements to establish a reference value that can be maintained at a specific value with no allowed variance would be a burden in that the system would have to be modified so that the discharge pressure could be tightly controlled at a specific value.

3.1.4 Conclusion

The request for an allowed variance of ± 1 psig of the reference value is granted pursuant to 10 CFR 50.55a(f)(6)(i) based on the impracticalities of maintaining a specific value of discharge pressure with no allowed tolerance. In granting this relief, the burden on the licensee has been considered.

3.2 Relief Request VR-1

OM-10 requires that check valves shall be exercised at least once every 3 months to the position required to fulfill their function unless such operation is not practical during plant operation. OM-10 also requires that

valves with remote position indication be observed locally at least once every 2 years to verify that the valve operation is accurately indicated. The licensee proposes to verify a number of valves' capability to close and the proper functioning of remote position indication at a frequency that would be determined by its containment isolation valve local leakage rate testing conducted during testing performed to meet 10 CFR Part 50, Appendix J, which will be based on performance of the valves.

3.2.1 Basis for Relief

The licensee states:

> All of the category "AC" check valve containment isolation valves listed in this relief request and the category "A" solenoid operated containment isolation valves will be leak tested in accordance with Federal Regulation 10 CFR Part 50, Appendix J, per paragraph 4.2.2.2 of OM-10. Paragraph 4.3.2.1 of OM-10, however, requires that the category "C" check valves be exercised nominally every 3 months (open and/or closed, depending on the safety function(s)) in addition to the leak test, and paragraph 4.1 requires that a position indication test be performed on the process sampling (PS) solenoid operated valves.
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> The check valves in this relief request do not have remote or local position indication devices to indicate the position of the check valve. Additionally, the 1/2CC9518, 1/2CC9534, and 1/2CV8113 check valves are containment isolation valves, but are also designed to open to relieve pressure between two other containment isolation valves. The process sampling solenoid valves are completely encapsulated so that local position verification can not be observed.
>
> The most practical method for verifying closure for the check valves in this relief request, verifying proper indication for the process sampling solenoid valve indication testing, and for the full stroke testing of the [component cooling] check valves, is through the execution of the Appendix J local leak rate testing methods. The closure test for these check valves is identical to the Appendix J local leak rate test. The indication testing for the process sampling encapsulated valves is determined through local leak rate testing flow measurements when the valves are leak tested, and opened, with corresponding remote verification of valve position in the control room. Finally, full flow is passed through the 1/2CC9518, 1/2CC9534, and 1/2CV8113 check valves during the local leak rate testing of their respective penetration (check valves are located between two other containment isolation valves).
>
> The testing in this relief request would not be practical to perform routinely at power or during cold shutdowns. The same

test equipment and testing methodology would be used to satisfy the testing in this relief request as for the Appendix J leak test, which involves a considerable amount of planning and set up, in addition to taking containment penetrations out of service. First, in considering the test equipment, the test rig and air supply lines would need to be run throughout the containment building and the penetration area. Secondly, the testing would involve determining plant conditions which would allow the test to take place, isolating boundary valves for each penetration affected, taking the boundary valves out of service (generally), draining between the boundary valves at a minimum (water-filled systems), performing the test, filling and venting the system (water systems), and returning to service any out of services which were previously placed.

In many cases, plant conditions at power would not allow this testing to be performed. For those cases in which the testing could be performed at power, routine quarterly testing would result in numerous containment entries, resulting in unnecessary exposure to neutron radiation in addition to the normal gamma and beta radiation. Testing these valves during cold shutdowns could result in unnecessary delays in unit startup and unnecessary accumulation of radiation dose.

Byron's Appendix J containment isolation leak testing program will soon be going to a performance-based testing program in which the frequency of testing may exceed a refueling outage frequency if the valves in question have experienced consistently good results in the past. The Appendix J Program will require an evaluation and justification for any valve in which an alternative to a refueling outage frequency is used. Since the closure testing in this relief request is identical to the Appendix J leak test, and the remaining tests in this relief request are completed during the execution of each valve's respective leak testing, it is practical to perform this testing at a frequency justified by Byron's Appendix J Program, which is in accordance with Federal Regulation 10 CFR Part 50, Appendix J. The testing frequencies set by the Appendix J Program will ensure an acceptable level of quality and safety for any category A leak test and for the testing included in this relief request.

3.2.2 Alternative Testing

The licensee proposes:

The closure testing of all the category "AC" check valves, the full stroke testing associated with the 1/2CC9518, 1/2CC9534, and 1/2CV8113 check valves, and the position indication testing of the 1/2PS228A/B, 1/2PS229A/B, and 1/2PS230A/B solenoid operated valves will all be completed at the same frequency as the leak test is

completed for each respective valve as determined by Byron's Appendix J Program.

3.2.3 Evaluation

The provisions of OM-10 allow that leakage testing of containment isolation valves be performed in accordance with the Appendix J requirements (i.e., local leakage rate testing). If these valves have a leaktight function other than for containment isolation (e.g., pressure isolation), then a test in accordance with OM-10 is required for the second leaktight function. Recently, Appendix J was changed to include a performance-based option (Option B) which allows extension of the local leakage rate testing beyond one refueling outage cycle. There is no conflict with the implementation of Option B when the IST program is in accordance with OM-10, other than as modified by 10 CFR 50.55a(b)(2)(vii) for acceptance criteria and corrective actions, for leakage testing of Category A valves. However, for those valves that are currently verified closed by performance of a local leakage rate testing each refueling outage, there is a conflict if the licensee applies the Option B schedule for testing the closure function in accordance with OM-10.

Under OM-10, check valves are to be exercised to the position(s) required to fulfill their safety function(s) quarterly, during cold shutdowns, or during refueling outages depending upon the practicality of performing the exercising during power operations or during cold shutdowns. In Section 4.1.4 of NUREG-1482, the staff recommended that, for check valves verified closed by leakage testing, the verification be performed on a refueling outage basis. The deferral is warranted due to the time necessary to set up equipment and perform the testing, as the design does enable other testing.

As to the position indication, OM-10 requires verification of proper indicating once every 2 years. The requirement is independent of other testing performed to meet OM-10, though the verification may be accomplished during one of the tests for stroking, fail-safe testing, or leakage testing.

The licensee has not provided justification to defer the exercising of the applicable check valves. Exercising, including closure verification, or position indication verification, need not be performed to the rigor required for local leakage rate testing. Water testing would be adequate to verify that a check valve or a solenoid valve is in a closed position, thereby negating the need for draining the water from the system. OM-10 includes disassembly and inspection as a means for exercising check valves. The licensee fails to discuss any other possible alternatives to local leakage rate testing for meeting the Code requirements for check valve exercising or position indication verification.

The ASME OM Committee has prepared Code revisions that address a condition monitoring program for check valves. The provisions include application of performance-based criteria for deferring exercising of check valves. These Code changes have not yet been published by the ASME, but have been approved for publication. The licensee is encouraged to review the concepts in

condition monitoring as a possible alternative to the exercising during refueling outages. When considering such a program, the safety significance of the valves should be a determining factor as well as valve performance.

3.2.4 Conclusion

The request is denied because the extended testing interval is not justified for exercising of check valves or for position indication verification. While extending the leakage testing is already acceptable under the provisions of OM-10, the Code includes no provisions for exercising valves at intervals beyond once each refueling outage. The NRC has recognized extensions for disassembly and inspection of a sample group of check valves beyond at least one each refueling outage only under <u>extreme</u> hardship. The licensee should consider other alternatives for exercising the valves and verifying position indication, or it must continue to perform leakage testing during each refueling outage.

3.3 Relief Request VR-2

The relief request concerns the schedule for disassembly and inspection of containment spray check valves. The specific valves are as follows:

Component(s)	Function(s):		Class	Category
1/2CS003A/B	Open:	Supply water to the spray nozzles	2	C
1/2CS008A/B	Open:	Provides flowpath to spray nozzles	2	AC
	Closed:	Containment Isolation (see VR-1)		
1/2CS011A/B	Open:	Supplies NaOH to suction of the CS pump (Eductor Outlet)	2	C
1/2CS020A/B	Open:	Supplies NaOH to suction of the CS pump (Eductor Inlet/Discharge of Spray Additive Tank)	2	C
	Closed:	Prevents backflow to the spray additive tank (quarterly test)		

The ASME Code test requirements for these valves, from the 1989 Edition of Section XI, OM-10, are that check valves shall be full-stroke exercised nominally every 3 months, or during cold shutdowns or refueling outages, if full stroking is impractical during power operations. Part-stroke exercising is to be performed if practical.

Position 2 of GL 89-04 indicates that the NRC considers disassembly and inspection an acceptable alternative when a check valve can not be exercised to the position required to fulfill its safety function. Additionally, paragraph 4.3.2.4(c) of OM-10 specifies that disassembly every refueling outage to verify operability of check valves may be used to demonstrate the necessary valve obturator movement.

3.3.1 Basis for Relief

The licensee states:

> General: Currently, full flow recirculation flow paths do not exist for the Containment Spray pumps. Extensive modifications to the existing plant design would be required to accommodate full flow testing of the 1/2CS003A/B and 1/2CS008A/B check valves, including the penetration of containment integrity. Additionally, NaOH in the spray additive tank limits the stroking of the 1/2CS011A/B and 1/2CS020A/B valves. Finally, the use of the nonintrusive techniques, such as acoustic monitoring and magnetics, have not been successful in proving full stroking on the type of valve (dual disk).
>
> The purpose of this relief request is to establish a basis for performing disassemblies on these valves as established in Generic Letter 89-04, position 2, "Alternative to Full Flow Testing of Check Valves," but not necessarily on a refueling outage basis. It is desirable to perform the disassemblies on the 1/2CS003A/B, 1/2CS011A/B, and 1/2CS020A/B valves during any mode (the 1/2CS008A/B valves will remain during outages due to their physical location in containment).
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> Per NUREG-1482, Appendix A, "Positions, Questions, Responses, and Current Considerations Regarding Generic Letter 89-04," Question Group 14 considers the question of disassembling valves during a non-refueling outage schedule. Under "Current Considerations" for this question group, it states that "If it is practical to disassemble and inspect the selected valves at a frequency not determined by refueling outages, the licensee may establish a schedule for these valves that does not conform to a refueling outage schedule. However, ...entry into an LCO [limiting condition for operation] to perform the activity may not be acceptable (See Section 3.1.2)." Byron Station feels that the entry into the Containment Spray LCO to perform these check valve inspections would not create a significant safety or equipment problem which would discourage this activity. Per Byron Technical Specifications 3.6.2.1 and 3.6.2.2, there is a 7 day LCO to restore an inoperable Containment Spray System. If this could not be met, then the shutdown process would begin. However, the work involved with these check valves is easily completed within the 7 day LCO. Additionally, having a Containment Spray Train inoperable is low in risk significance when considering Byron's PRA [probabilistic risk assessment] analysis. Byron Station feels that it would be practical to disassemble and inspect these valves during nonoutage time periods.
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> This proposal is predominantly based upon the results of previous inspections at Byron and Braidwood stations, in which there has been

no evidence of degradation or physical impairment which would inhibit the valves from performing their safety function. These valves are not expected to experience degradation or impairment since the valves are infrequently actuated. A company wide check valve evaluation addressing the "EPRI [Electric Power Research Institute] Application Guidelines for Check Valves in Nuclear Power Plants" revealed that the location, orientation and application of these valves are not conducive to the type of wear or degradation correlated with [Institute of Nuclear Power Operations] SOER [significant operating event report] 86-03 type problems. An 18 month frequency is being requested for the 1/2CS003A/B, 1/2CS011A/B, and 1/2CS020A/B valves to be consistent with Byron's current refueling outage frequency of 18 months.

Because of the significant work involved with the isolation, draining, maintenance, inspections, and partial stroke testing of the valves, along with the superior results of past inspections, it is clearly impractical and burdensome to perform disassemblies as frequently as quarterly or during cold shutdowns. Additionally, it would not be consistent with Generic Letter 89-04.

Additional technical support in justification for this relief request is provided for each set of valves in parts A-D of this section.

A. <u>1/2CS008A/B</u>: With the existing plant configuration, these valves can not be full flow or partial flow tested during unit operation, cold shutdown or refueling, as water from the CS [core spray] pumps would be discharged through the CS ring headers, causing undesirable effects on system components inside containment. Additionally, it is impractical to erect temporary large bore piping from the CS line to the reactor cavity, during cold shutdowns or refueling outages, in order to perform a full stroke test on these valves. The filling of the cavity would require the removal of the reactor vessel head to preclude equipment damage from borated water and the construction of the temporary piping would take an estimated nine to twelve shifts (or longer) to complete. There would be even more time involved with the draining and removal of the piping from containment following the completion of the test.

   Partial stroking of these valves using air during unit operation, cold shutdown, or refueling does not provide adequate assurance of valve operability and may be detrimental for the following reasons:

   a. There is no correlation between air flow and angle of disc movement.

b. Venting and draining the required portion of piping to perform this test may cause deposition of boric acid residue which could in turn promote binding of the check valve internals.

B. 1/2CS003A/B: These valves can not be full stroke tested due to the existing plant configurations, as previously discussed for the 1/2CS008A/B valves. However, these valves are partially stroked quarterly since they are in the flowpath of their respective Containment Spray pump runs.

C. 1/2CS011A/B: These valves can not be full stroke tested (130 gpm eductor flow plus 55 gpm NaOH flow) during unit operation or cold shutdown as NaOH from the spray additive tank would be discharged throughout the CS system causing undesirable chemical effects on the reactor makeup supply (RWST) and associated systems. Additionally, personnel safety would also be a factor. However, these valves are partially stroked quarterly during respective Containment Spray Pump runs in which the eductor flow passes through the valve, but the spray additive tank is isolated, eliminating the NaOH flow required for the full stroke.

Full flow testing of these valves (and the CS020A/B valves) is accomplished a minimum of once every 5 years through the use of a temporary test hook-up in which flushing of the system is necessitated. Performing this testing on a more frequent basis is undesirable due to the accumulation of nearly two 55 gallon drums of potentially radioactive/toxic mixed waste that requires either recycling or disposal. Additionally, the handling of this material poses a significant safety hazard to personnel, resulting in eye damage and/or chemical burns if splashed or spilled. This testing, currently performed every five years per Technical Specification 4.6.2.2, would be impractical and burdensome to perform on a more frequent basis.

Non-intrusive techniques (acoustics and magnetics) have been attempted with unsuccessful results since the amount of flow required to full stroke the disks (critical velocity of 10 ft/sec) can not be obtained based on current system design.

D. 1/2CS020A,B: These valves can not be full stroked or partial stroked during unit operation, or cold shutdowns, for the same reasons as stated for the full flow testing of the 1/2CS011A/B valves. The Spray Additive tank is isolated during pump runs, so no flow is passed through the 1/2CS020A/B valves during this testing.

Additionally, the Tech[nical] Spec[ification] full flow test, performed a minimum of once every five years, would

> apply to these check valves in addition to the 1/2CS011A/B valves. The hardship involved with the hazardous mixed waste disposal and handling caustic material with regards to personnel safety does not provide a compensated increase in safety of the CS system equipment (in regards to performing the test more than once every five years). The five year frequency on this Tech[nical] Spec[ification] test in conjunction with the disassemblies performed, will more than adequately ensure operability of these valves.

3.3.2 Alternative Testi

The licensee proposes:

> Per Generic Letter 89-04, position 2, "...valve disassembly and inspection can be used as a positive means of determining that a valve's disk will full stroke exercise open..." The provisions of this position may be used in the case of the CS check valves for the open direction as follows:
>
> The A and B train valves for each valve number are of the same design (manufacturer, size, model number, and materials construction) and have the same service conditions, including orientation, and, therefore, form sample disassembly groups.

Group 1 (U-1)	Group 2 (U-1)	Group 3 (U-1)	Group 4 (U-1)
1CS003A	1CS008A	1CS011A	1CS020A
1CS003B	1CS008B	1CS011B	1CS020B

Group 1 (U-2)	Group 2 (U-2)	Group 3 (U-2)	Group 4 (U-2)
2CS003A	2CS008A	2CS011A	2CS020A
2CS003B	2CS008B	2CS011B	2CS020B

> Group numbers 1, 3, and 4: One valve from each group, on a per unit basis, will be disassembled on an eighteen month frequency during any plant mode. If the disassembled valve is not capable of being full-stroked exercised or if there is binding or failure of valve internals, the remaining valve on the affected unit will be inspected soon after the repair or replacement of the problem valve (within 30 days of the return to service date). Additionally, following re-installation, the 1/2CS003A/B and 1/2CS011A/B valves will be partial stroke tested using the CS pumps and the 1/2CS020A/B valves will be partial stroke tested using an alternate water source (Note: the 1/2CS020A/B test for the closed position is currently performed quarterly during the execution of the respective CS019 stroke time test). When the Technical Specification full stroke testing of the respective CS020 and CS011 valves is completed, it

may be used to satisfy the full stroke testing in lieu of the disassembly plan (if within the 18 month frequency guidelines established).

Group number 2: One valve from each group, on a per unit basis, will be disassembled on a refueling outage frequency. If the disassembled valve is not capable of being full-stroke exercised or if there is binding or failure of valve internals, the remaining valve on the affected unit will be inspected prior to startup. This methodology is consistent with Generic Letter 89-04, Position 2. Prior NRC approval is not required. Additionally, following reinstallation, the 1/2CS008A/B valves will be leak tested per [their] Category A Appendix J leak rate test. In addition to the leak test to verify proper installation, the valve inspection procedure requires a post-installation visual examination of the check valves (as it does for all disassemblies), with dual verification, to insure that the pin is oriented properly and that the flow direction is correct. This will ensure the correct installation of the valve.

3.3.3 Evaluation

ASME Code Requirements: OM-10 requires a full-stroke exercise of certain safety-related check valves quarterly, if practical, and provides a hierarchy for part- 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 containment spray system check valves (see list above) on a sampling basis at an interval similar to a refueling outage interval.

Inservice Testing of the Containment Spray System Check Valves: The containment spray system check valves can not be full-stroke tested with flow without creating a hardship on or posing an unusual difficulty for the licensee in establishing a configuration to effect testing. Where practical, a portion of the listed valves are partial-stroke exercised quarterly. 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, with a secondary result of creating chemical or mixed wastes that must be treated. 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 can not be meaningfully applied. The history of the valves indicates that they have not experienced degradation, nor would the design and configuration contribute to accelerated degradation based on the referenced EPRI guidelines on check valve applications.

Since it is impractical or unusually difficult to meet the exercise requirements of paragraph 4.3.2 of OM-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).

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 on an 18-month interval during any plant mode, except that; (1) valves 1/2CS008A/B will remain on a refueling outage frequency meeting the guidance of Position 2 of GL 89-04, and (2) a technical specification required, once every five years, full flow test for valves 1/2CS011A/B and 1/2CS020A/B may be used in lieu of disassembly and inspection if the schedule permits. Such a schedule is not necessarily based directly on the GL 89-04 or OM-10 interval of "refueling outage," but is 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 condition for operation (LCO) action statement to perform regularly scheduled maintenance similar to preventative 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 is 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, 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 18 months) 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 "soon after the repair or replacement of the problem valve (within 30 days of the return to service date)." 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, unless a valve-specific root cause is identified. When a potential common-cause failure is identified and until the operational readiness of these valves is verified by disassembly and inspection or by testing, their continued capability to perform their function can not 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 grouped 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 grouped 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 within at least 30 days does not comport 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 did not indicate the acceptability of entering into 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 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 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 any 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 inspections.

- 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 Section 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," became effective July 10, 1996. This regulation does not prohibit on-line maintenance activities. However, 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.

3.3.4 Conclusion

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 valves 1/2CS011A/B and 1/2CS020A/B, full-flow testing performed to meet technical specifications may be acceptable to complement the disassembly and inspection with testing once every 5 years, if the schedule can be coordinated, because the testing verifies full-stroke exercising of the valves. Considering that it would be a hardship without a compensating increase in the level of quality and safety to require disassembly and inspection at the same time as the full-flow testing, the alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(ii).

For performing disassembly and inspection during any plant mode, the alternative schedule is authorized pursuant to 10 CFR 50.55a(a)(3)(i) based on the activity ensuring an adequate level of quality and safety provided the licensee considers all the appropriate guidance referenced and conditions discussed in Section 3.3.3 of this SE including a determination that the activity can be performed in a manner that does not increase the risk to the plant. 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 operations rather than during plant shutdowns. The proposal to allow up to 30 days to examine remaining valves in a group where a degraded valve has been identified is not acceptable. Corrective actions must be taken as discussed in Section 3.3.3, above, and a maximum time period must be determined based on the identification of degradation and assessment of the cause.

3.4 Relief Request VR-3

Class 3, Category B, valves 1/2SX101A are the Essential Service (SX) Water outlet isolation valves for the Unit 1 and 2 motor driven Auxiliary Feedwater (AFW) Pump lube oil coolers. These valves are required to open to provide a flow path for Essential Service Water through the motor driven AFW pump oil coolers. These valves are required to be exercised, stroke timed, and fail-safe tested in accordance with paragraph 4.2.1 of OM-10.

3.4.1 Basis for Relief

The licensee states:

Both of these valves are completely encapsulated per design and do not have local or remote position indicators which could be used to time the valve stroke.

The 1/2SX101A valves are pilot operated globe type solenoid valves which are energized to close. Upon de-energizing (pump start), the valve opens with the aid of a spring force against the plunger, and differential pressure across the main disk. Upon energizing, the valve closes by the magnetic force of the coil pulling the plunger down and pressure buildup above the main disk. In the absence of any pressure differential across the main disk, the spring or magnetic force is sufficient to open or close the valve, respectively.

Per the Code requirements, these valves can not be tested by the traditional means of stopwatch and indicating lights. The proposed alternative testing will adequately maintain the system in a state of operational readiness, while not sacrificing the safety of the plant.

3.4.2 Alternative Testing

The licensee proposes:

The 1/2SX101A solenoid valves will be verified to open during each quarterly ASME surveillance of the motor driven Auxiliary Feedwater Pumps. In addition, these valves are stroked monthly during Auxiliary Feedwater Pump surveillance required by Byron Station Technical Specifications.

3.4.3 Evaluation

The valves were not designed to enable inservice testing requirements to verify obturator travel, stroke time, or fail-safe functioning directly (e.g., position indicating lights). Therefore, it is impractical to monitor these valves in conformance with all of the requirements of OM-10. Imposing the Code requirements would be a burden in that the valves would have to be replaced or modified or new testing techniques would have to be implemented. Malfunctioning of the valves (i.e., not opening) would be evidenced during an AFW pump test of sufficient length to cause the pump lubricating oil to heat up if cooling water is not supplied. Hence, the licensee has committed to perform such verification of valve opening each quarter during the AFW pump surveillance testing. Acceptance criteria must be included in test procedures, depending on the method of verifying that the valves stroke.

The valves also stroke when the AFW pump monthly surveillance is performed. These valves are normally closed, normally energized solenoid valves. The monthly stroking can help to ensure that the valves are exercised regularly to prevent any sticking that might occur due to the design of the valves.

Solenoid valves may be susceptible to sticking when normally energized and not exercised for long periods of time.

Though the licensee's basis does not discuss the expected stroke time, most solenoid valves are rapid-acting valves and stroke within 2 seconds. For rapid-acting valves, the Code requires a limiting stroke time of 2 seconds. The proposed alternative testing will not give any indication of rapid stroking, thereby precluding any assessment of increasing stroke times to identify the onset of sticking problems. However, no trends are established for rapid-acting valve stroke times — the testing is a pass or fail test. Therefore, even though the assessment of stroke times increasing over 2 seconds will not be available, verification of stroking during the quarterly pump testing will provide a level of adequate assurance of the operational readiness of the valves in consideration of the limitations of design features for testing. In the future, if testing techniques are implemented by the licensee that will easily determine the stroke time of the valves (e.g., diagnostic methods), the licensee should begin stroke time testing these valves. Additionally, because the condition of the valves will not be monitored, a preventative maintenance program should be implemented for periodic maintenance of these valves.

3.4.4 Conclusion

For the AFW pump lube oil cooler service water isolation valves, relief from the Code requirements for power-operated valves is granted pursuant to 10 CFR 50.55a(f)(6)(i). Granting the relief is based on the impracticalities in the design of the valves that limit inservice testing in the traditional manner using position indicating lights. The burden on the licensee if the Code requirements were imposed has been considered. In implementing this relief request, the licensee must include acceptance criteria in the test procedure which is related to the method of verifying that the valves stroke during the quarterly pump test.

3.5 Relief Request VR-4

Class 3 check valves 1/2AF001A/B close to maintain adequate suction to the AFW pump and to prevent loss of service water to the condensate storage tank when service water is used as the water source. The open function is verified during cold shutdown and is addressed in cold shutdown justification VC-11. OM-10 requires check valves to be exercised quarterly, or if impractical at power operations, during cold shutdowns or refueling outages.

3.5.1 Basis for Relief

The licensee states:

> Performing a pressure test (by attaching a pump or other pressure source to a test connection and pressurizing the line) to verify closure is impractical due to the system configuration. Adequate closure capabilities of these check valves can not be verified due

to the multiple potential leakage paths (valves, pump seal, and instrument lines). This configuration makes it impossible to assign any observed leakage to any individual component.

Since there are no conventional ways to verify closure of these check valves, acoustic monitoring has been investigated. First, it was attempted to verify closure during the Operating Department Cold Shutdown full stroke test of the 1/2AF001A/B valves in which only a single train of AFW [Auxiliary Feedwater] is run at a time. With an AFW pump running on mini-flow recirculation, flow is initiated to each S/G [Steam Generator] and increased on a gradual basis, while simultaneously reducing feedwater flow. As soon as the required flow data is obtained, AFW flow is gradually reduced, while simultaneously increasing feedwater flow. This is done to minimize feedwater perturbations to the S/Gs. Due to this gradual change in flow, the open and closed acoustical impacts can not be detected with acoustical equipment.

However, the acoustic data taken during the 18-month dual pump injection test has provided Byron with a limited amount of success in detecting closure of the 1/2AF001A/B check valves. This test is only performed on refueling outage frequencies due to the large transient placed on feedwater flow and the thermal stresses imposed on the Steam Generators. This technique may continue to be pursued in future outages.

However, until this method, or an alternative nonintrusive method indicates a high level of confidence in repeatability, Byron will continue to carry out the sample disassembly program, in accordance with Generic Letter 89-04.

The removal of these valves for disassembly requires that the system be taken out of service for an extended period of time. Due to Safety System Performance, Probabilistic Risk Assessment (PRA) analysis, and availability concerns involving the Auxiliary Feedwater System, it is clearly impractical to remove these valves from the system on a quarterly basis.

Maintenance history and previous inspections of these valves at both Byron and Braidwood Stations have shown no evidence of degradation or physical impairments. Industry experience, as documented in NPRDS [nuclear plant reliability data system], has shown no history of problems with these valves. A company wide check valve evaluation addressing the "EPRI [Electric Power Research Institute] Application Guidelines for Check Valves in Nuclear Power Plants" revealed that the location, orientation, and application of these check valves are not conducive to the type of wear or degradation correlated with SOER [significant operating experience report] 86-03 type problems.

3.5.2 Alternative Testing

The licensee proposes:

> The A train and the B train valves are of the same design (manufacturer, size, model number, and materials construction) and have the same service conditions, including orientation, and therefore form a sample disassembly group.
>
> | Group 1 | Group 2 |
> |---|---|
> | 1AF001A
1AF001B | 2AF001A
2AF001B |
>
> Per Generic Letter 89-04, position 2, one valve from each group, on a per unit basis, will be tested each refueling outage. If the disassembled valve is not capable of being full stroke exercised or if there is binding or failure of the valve internals, the remaining valve on the affected unit will be inspected prior to startup.
>
> However, if acoustic testing clearly indicates that both of the 1/2AF001A/B check valves indicate closed in a particular outage, then the valve set to be inspected for a particular outage may be omitted for that outage. In this case, this relief request becomes a refueling outage justification for the closure testing of the 1/2AF001A/B check valves in accordance with OM-10, paragraph 4.3.2.2.

3.5.3 Evaluation

OM-10 indicates that disassembly and inspection of check valves is an acceptable alternative to other means of verifying obturator movement. It does not, however, address sampling; thus, each check valve must be disassembled and inspected each refueling outage with no allowance for grouping similar valves. The licensee's basis for relief discusses a number of reasons why the sampling program provides an acceptable alternative to disassembly and inspection of each valve during each refueling outage. Because the NRC discussed in GL 89-04 grouping check valves for the purposes of disassembly and inspection, and the licensee's proposal states that the guidance of Position 2 in GL 89-04 is met, the proposal provides an acceptable alternative.

3.5.4 Conclusion

The use of a sampling program for disassembly and inspection was deemed an acceptable alternative to the requirements of IWV-3520. It is also an acceptable alternative to the requirements of OM-10 for the same reasons given in the guidance regarding the burden of disassembling and inspecting all similar valves each refueling outage. Therefore, the licensee's proposal is

authorized pursuant to 10 CFR 50.55a(a)(3)(i) based on the acceptable level of quality and safety that the alternative provides.

3.6 Relief Request VR-5

The relief request applies to Code Class 2 check valves 1/2FW079A/B/C/D which isolate steam generators from an upstream feedwater pipe break.

3.6.1 Basis for Relief

The licensee states:

> The main feedwater header flow check valves are 16-inch tilting disk check valves built with a vertical piston and rod assembly that serves as an anti-slam mechanism; the valves do not have external position indicators. The valves are designed to have a delayed closure time of 2 to 3 seconds to isolate flow during a feedwater line break accident without inducing significant water hammer transients. Their closed safety functions are to; 1) mitigate a loss of secondary inventory and/or make-up, and 2) provide pressure integrity between the safety and non-safety related portions of piping.
>
> These valves can not be exercised to their closed position during power operations because feed flow to a steam generator (S/G) would be isolated, causing loss of Steam Generator water inventory and a subsequent low S/G level Reactor Trip.
>
> Non-intrusive testing during cold shutdowns has been attempted at Braidwood and Byron Stations with still unproven results. Specifically, ultrasonic examination of the piston rod position has not conclusively demonstrated valve closure: The anti-slam mechanism prevents the disk from travelling completely to its seat after cessation of forward flow. In fact, during normal feedwater system shutdown evolutions, the valves routinely come to rest at a partial open position -- substantial reverse flow or reverse differential pressure would be required to bring the disk into contact with the seat.
>
> Traditional backflow testing methods were considered, but it has been determined that reverse flow and/or differential pressure sufficient to close the valve can not be obtained without major modification to the existing plant configuration. Clearly, acoustic testing techniques which require contact noise between disk and seat can not be used for this application, either.
>
> Full-stroke exercising these valves by performing complete disassembly and inspection of each valve during cold shutdown conditions is undesirable and impractical because:

1) The main feedwater system would have to be drained. This would both delay reactor start-up and eliminate a method of reactor decay heat removal. The latter, in particular, could adversely affect shutdown safety.

2) Complete disassembly often requires machining activities that remove metal from the valve walls which may jeopardize minimum wall thickness. If minimum wall thickness is approached, then costly and difficult weld overlay techniques and associated machining would be required.

3) Scaffolding must be built and removed to allow examination of these valves.

Full-stroke exercising these valves by performing partial disassembly (i.e., removing only the actuator bonnets) of all four valves on a refueling or cold shutdown frequency is burdensome because of the system draining necessary and the potential wall material loss associated with disassembly and inspection work.

Because major plant modifications would be required to establish enough reverse flow/pressure to fully close the valves, in-service testing in accordance with NRC Generic Letter 89-04 is justified. The Generic Letter allows valves of similar design, service conditions, etcetera to be classified in sample disassembly and inspection groups of up to four members with testing of one valve in the group during each refueling outage.

In-service testing of the valves that close on a feedwater isolation signal, including the safety-related feedwater containment isolation valves (FW009A-D), the non-safety-related feedwater regulating valves (FW510, 520, 530, 540), and the feedwater regulating bypass valves (FW510A, 520A, ...) helps ensure that the power operated valves and the system are capable of safely responding to an initiating feedwater line break accident regardless of FW079 check valve position.

The alternate test method is sufficient to ensure operability of these valves and is consistent with Generic Letter 89-04 sample disassembly and inspection program. The alternate test method in conjunction with other existing in-service testing of feedwater valves is more than sufficient to ensure the system's ability to safely respond to a feedwater line break accident.

3.6.2 Alternative Testing

The licensee proposes:

> The four valves on each unit are of the same design (manufacturer, size, model number, and materials of construction) and have the same service conditions, including orientation; therefore, they form a sample disassembly group.
>
> One valve from each group, on a per unit basis, will be fully disassembled and examined each refueling outage. If the initial disassembled valve is not capable of being full stroke exercised or if there is binding or failure of internals, subsequent disassembly and inspection of the remaining three group members will be commensurate with the initial valve's failure mode.
>
> This means that the remaining three valves may be "partially" disassembled, which refers to the removal of the actuator [upper] bonnet for inspection of the piston, piston seal ring, mating surfaces, and also for manual full stroke closing. A "fully" disassembled valve (minimum of one per outage) would additionally include removal of the valve body [lower] bonnet, giving access to the disk and seating surfaces. The subsequent disassembly requirements would be satisfied through either "partial" or "full" disassemblies depending on what is found with the initial disassembled valve. This will both satisfy the testing requirements to demonstrate all four valves' ability to perform their safety function and minimize the potential concerns regarding minimum wall thickness discussed earlier. This approach is consistent with Generic Letter 89-04, position 2.
>
> A partial stroke test following complete installation will not be required for these check valves since an "as left" stroke is performed prior to the installation of the actuator bonnet; installation of the actuator bonnet does not affect the stroke of the valve. In addition, the plant operates with these valves in the open position and open stroke problems would be readily identified during plant startup.

3.6.3 Evaluation

OM-10 indicates that disassembly and inspection of check valves is an acceptable alternative to other means of verifying obturator movement. It does not, however, address sampling; thus, each check valve must be disassembled and inspected each refueling outage with no allowance for grouping similar valves. The licensee's basis for relief discusses a number of reasons why the sampling program provides an acceptable alternative to disassembly and inspection of each valve during each refueling outage. Because the NRC discussed in GL 89-04 grouping check valves for the purposes of disassembly and inspection, and the licensee's proposal states that the

guidance of Position 2 in GL 89-04 is met, the proposal provides an acceptable alternative.

3.6.4 Conclusion

The use of a sampling program for disassembly and inspection was deemed an acceptable alternative to the requirements of IWV-3520. It is also an acceptable alternative to the requirements of OM-10 for the same reasons given in the guidance regarding the burden of disassembling and inspecting all similar valves each refueling outage. Therefore, the licensee's proposal is authorized pursuant to 10 CFR 50.55a(a)(3)(i) based on the acceptable level of quality and safety that the alternative provides.

3.7 Relief Request VR-6

Essential service water to makeup pump discharge Code Class 3 check valves OSX028A/B perform a safety function in both the open and closed position. The valves close to prevent piping drain down from the basins to the river screen house. The valves open to allow essential service water makeup water to the basins. The valves are full-flow tested open quarterly, but an alternative frequency for the reverse flow test is proposed.

3.7.1 Basis for Relief

The licensee states:

> The backflow test for the OSX028A/B check valves was added to the IST Valve Program in Rev 12 of the First Ten Year IST Interval Program due to their closure function to prevent piping drain down from the basins to the river screen house. Since their incorporation into the program, the OSX028A and OSX028B check valves have been successfully tested for closure using acoustics during the respective A or B makeup pump runs a minimum of once each quarter. Each valve has successfully been tested 7 consecutive times without any signs of degradation or failure.
>
> Nonintrusive techniques are considered to be "other positive means" in accordance with ASME Section XI IWV-3522. As described in NUREG-1482, nonintrusive techniques may be used to verify the capability [of check valves] to open, close, and fully stroke.
>
> The acoustic testing of both of these valves on an eighteen month frequency (at approximately the same time period) is justified for the following reasons:
>
> Byron Response:
>
> a. Low Risk Significance Associated with the Check Valves Failing to Close:

The failure of these check valves to close is considered a non-risk significant event due to the redundant equipment available to ensure that the basins will retain their inventory and receive makeup cooling water, as required. The failure of these check valves to close is not specifically modeled the PRA. When evaluating risk, all safety and non-safety related equipment available for mitigating the event, is reviewed. If one of these valves fails to close and backleakage occurs, the line could be isolated from the basin by closure of a manual valve next to the check valve (not tested by IST) or MOVs near the entry into the basin (not tested by IST). An alternate way to overcome the leakage would be to start up the pump on the line with the defective valve. Finally, there are alternate ways to makeup to the SX [Essential Service Water] basins, which include the non-safety related Circulating Water makeup lines or the non-safety related, but seismically qualified, Deep Well Water makeup lines. During normal operation, Circulating Water is the preferred method of makeup to the basin. Additionally, the two SX basins overflow into each other at a level of 64 percent.

b. <u>Low Safety Significance Associated with the Check Valves Failing to Close:</u>

The safety significance of these check valves failing to close would result in a potential for piping drain down from the basins to the river screen house, approximately 5 miles away from the plant. The safety-related SX makeup pumps are the emergency source of makeup to the basins. If an SX pump is called upon to operate in a post-accident situation, it is desirable to avoid the potential delay involved in transporting water to the basin to ensure that the ultimate heat sink analysis remains valid. The ultimate heat sink consists of the two essential service water mechanical draft cooling towers and the makeup system to these cooling towers. The elevation difference of approximately 200 feet between the river and the SX basins make this a possibility.

The SX basins should not be drained to a point of concern even if one of the makeup check valves did fail. During normal operations, the SX "A" and "B" basin levels are maintained at approximately 82 percent, with makeup generally coming from the non-safety related Circulating Water pumps. At 64 percent level, the SX basins overflow into one another. If the level in one basin reaches 56 percent, an alarm is received in the Control Room and automatic makeup from the respective SX makeup pump begins at 53 percent level. Even if the alarms and automatic makeup failed, the SX makeup lines enter the basin at a level near the Technical Specification limit of 50 percent, ensuring that significant levels will remain in the basins.

Additionally, either train of SX makeup would be capable of supplying the basins with enough water to satisfy the ultimate heat sink analysis.

In the unlikely event that the downstream piping of an SX Makeup Pump were to completely drain, the pump suction at the river would have enough suction head to allow the refilling of the downstream piping and establishment of makeup to the SX basin without extraordinary operator actions or damage to the SX Makeup Pump. The failure of one of these check valves to close would be minimal and easily overcome.

c. Acoustic Testing:

Performing the acoustic test on both valves on an eighteen month frequency will ensure the operational readiness of the valves. These valves have been in operation for approximately 10 years without failure and have successfully passed their acoustic testing for seven tests in a row since being added to the IST program.

Byron's assessment of this valve is solely based on the testing performed on the valve. The open valve position is tested quarterly with full flow during each pump run. An acoustic test is used to prove closure. This test is currently performed quarterly, during the same surveillance, when the pump is shut down. Due to the elevation differences between the piping discharging into the basin and the much lower elevation of the river screen house (location of the SX makeup pump discharge check valves), a good signal is recorded for the closure of these check valves.

A maintenance history review of these SX discharge check valves has indicated that maintenance has been nonexistent since startup on these valves. There are no past or present work requests for them. However, due to the corrosive nature of the SX system, Byron plans on beginning a program to disassemble and inspect a series of SX check valves associated with maintaining the ultimate heat sink water inventory (included are the "A" and "B" train IST check valves for Circulating Water makeup, "A" and "B" train IST check valves for isolating the Deep Well Water makeup, and the SX makeup check valves discussed in this relief request). Byron currently has internal parts for the first valve disassembly, but is waiting for a valve body to arrive. This would allow a quick disassembly and replacement necessitated by LCOAR [Limiting Condition for Operation Action Requirement] time requirements. If a rebuild is required, maintenance personnel could do this without the time pressures involved with the LCOAR. This program will begin shortly after the arrival of the valve body

(replacement . . . [occurred] during the 1st quarter of 1996). Following the inspection of these valves, the results will be reviewed to determine an optimum disassembly interval. Based on the good test results obtained for the SX discharge check valves for closure and the fact that they have not failed in over 10 years, these check valves may be inspected last in the rotation. These disassembly and inspections will be highly dependent on the availability of parts and appropriate plant conditions, but completion of this rotation would be expected within the next few years.

d. Quarterly Testing:

The A and B SX makeup pump surveillance will continue to be executed for IST on a quarterly basis. During this testing, the check valve will be experiencing the same evolution as it does when the backflow acoustic test is completed. The check valve will be opened and then closed on cessation of flow. The full flow test will be completed quarterly, verifying operability in the forward flow direction.

e. Eighteen-Month Testing:

In addition, this eighteen month frequency will reduce the amount of manhours required in performing the acoustics at the river screen house a few miles from the Byron plant on the Rock River. For each test (8 times a year), approximately one full day (8 days a year) is expended by the qualified acoustic monitoring individual to transfer the equipment to the river screen house, set up the equipment, record the data, transfer the equipment back to the station, evaluate the data, and complete surveillance.

A typical test day would begin down at the river screen house, setting up, coordinating with Operations and the System Engineer for running the test. The afternoon would typically be spent evaluating the data and completing the surveillance.

Byron's Check Valve Program resides in the Site Engineering Programs group. Individuals within this group generally have multiple responsibilities assigned to them. One responsibility of the Check Valve Coordinator is to perform acoustic tests on check valves, where applicable. In addition, this individual is responsible for maintaining a Check Valve Program of over 500 valves (with plans to review another 2000 balance of plant check valves). Additional tasks of the individual who has recently become the Check Valve Coordinator includes the ASME Pressure Test Program. Byron does not have an individual who is totally dedicated to acoustic monitoring. The individual

who performs this testing will always have other collateral duties which will consume a considerable amount of time. Hence, it is desired to test components such as these check valves at a frequency which is commensurate to their level of safety to ensure all activities receive the appropriate level of attention.

3.7.2 Alternative Testing

The licensee proposes:

Byron proposes to complete both of the OSX028A/B backflow acoustic tests at a minimum of once per 18 months.

3.7.3 Evaluation

The licensee's proposal is similar to a refueling outage justification, but the frequency of once per 18 months is not based on any particular plant operating condition. However, there is justification to allow extension of quarterly verification of the valves' capability to close. There are no design features that enable verification of closure. The current practice of performing the verification using nonintrusive techniques each quarter is burdensome in that setup of the test equipment is resource intensive and time consuming. In Section 4.1.2 of NUREG-1482, the NRC recommends that a sampling program for nonintrusive monitoring of check valves be implemented on those check valves that can not be practically tested otherwise. Though the licensee has not proposed a sampling program, the proposed schedule is consistent with the schedule discussed in the NUREG and is also consistent with an 18-month refueling outage test frequency. Therefore, the proposed alternative will provide adequate assurance of operational readiness of the valves similar to extending the test interval to a refueling outage which is allowed by the Code. The licensee must ensure, however, that the 18-month schedule is maintained without regard to operational modes.

3.7.4 Conclusion

Relief is granted pursuant to 10 CFR 50.55a(f)(6)(i) based on the impracticalities of the design for verifying closure of the valves. The burden on the licensee if the Code requirements were imposed has been considered in granting this relief.

3.8 Relief Request VR-7

An alternative for measuring the flow through the deep well pump discharge check valves OSX127A/B to verify the valves' capability to open is proposed. Additionally, an alternative test schedule is proposed that would be consistent with plant technical specification requirements.

3.8.1 <u>Basis for Relief</u>

The licensee states:

The OSX127A and OSX127B check valves open to provide a flow path for Deep Well Water to the Ultimate Heat Sink as a backup to the Emergency Makeup Pumps. The nonsafety related, seismically qualified, Deep Well Pumps (OWW01PA/OWW01PP' are physically inaccessible and were not designed or installed in accordance with ASME Code and are not required as long as the Emergency SX Makeup Pumps are available. Although the pumps do not fit the requirements of the IST Program, they do have significant importance and are tested outside of the IST Program as required per Tech Spec 3/4.7.5. The safety related check valves referenced in the relief request were conservatively added to the IST Program in the open direction to acknowledge the importance of ensuring the deep well flow path is capable of transferring water to the ultimate heat sink.

In reference to the deep well pumps, per Tech Spec 4.7.5, the Ultimate Heat Sink shall be determined operable: at least once per 31 days by starting a deep well pump, operating it for at least 15 minutes and verifying that each valve (manual, power-operated, or automatic) in the flow path is in its correct position, and, at least once per 18 months by verifying each deep well pump will provide at least 550 gpm flow rate.

Byron proposes to complete a full stroke test for check valves OSX127A and OSX127B at a minimum of once every eighteen months, as required by Technical Specifications. Testing on a more frequent basis would be completed in accordance with station commitments. This test will be accomplished by executing the Byron Station deep well surveillance in which, first, the "A" pump is lined up to the "A" basin and an ultrasonic flowmeter is attached to the makeup line (following the removal of a security barrier). The demand (throttling) valve is opened until a minimum flow reading of at least 550 gpm is obtained through the line (and check valve OSX127A). In addition, the amperage of the pump is recorded. Then, the "A" pump is shut down and the valves are re-aligned to the "B" basin, in which there is no accessible piping of adequate length to attach an ultrasonic flowmeter. However, the same "A" pump is restarted and set to an amperage greater than or equal to the amps just recorded for the A basin flowpath. Byron Station trends flow versus amps for the Deep Well Pumps to help track degradation within the pumps, as required through a station commitment to the NRC. This should assure a full stroke test for the OSX127B check valve (using other "positive means"). In addition, the A and B basins overflow into each other at 64 percent level, minimizing the importance of knowing the exact flow through the "B" makeup line (although it should be the same as just recorded through the "A" makeup line). Finally, the "B" pump is verified to generate an

output greater than 550 gpm through the "A" train makeup line to satisfy the Tech Spec requirement.

In addition to the above testing, Byron will ensure operability of the Deep Well Pumps by executing an operating surveillance monthly in which the "A" pump is lined up to the "A" basin and the "B" pump is lined up to the "B" basin. In each case the demand for each pump will be at or near 100 percent, which should assure a full stroke of each check valve every month. However, since flow is not measured, it will be considered a partial stroke each month.

The alternative testing requirements will not compromise the level of quality and safety when compared to quarterly Code testing for the following reasons:

a. Byron Tech Specs are being satisfied through the eighteen month Deep Well Pump procedure and the monthly operating procedure. This testing will satisfy the operability requirements for the Deep Well Pumps and the flowpaths to the SX basin. In addition, the same or more flow is transferred through the check valves each month than during the procedure executed every eighteen months. The flowrates would be verified during the eighteen month procedure.

b. An ultrasonic flowmeter can not be used on the "B" basin makeup line due to the lack of accessible piping available. In addition, at this time, inconclusive acoustic results were obtained for the full stroke testing on these valves. Finally, flow versus amps is trended to help aid in determining any degradation in the Deep Well Pumps.

3.8.2 Alternative Testing

The licensee proposes:

These valves will be tested in accordance with Byron Tech Specs. The full stroke test for check valves 0SX127A and 0SX127B will be completed on an eighteen month frequency in addition to a monthly flowpath verification (considered partial stroke).

3.8.3 Evaluation

The design for the deep well water system does not include flow instrumentation. Strap-on ultrasonic instrumentation can be used on the Train A flowpath, but can not be used on Train B because there is no section of piping that meets the length requirements for proper operation of the flow meters. The licensee runs the pumps for at least 15 minutes each month to meet a technical specification surveillance requirement. In this manner, the discharge check valves are partial-stroke exercised monthly. The capability

of the valves to close is tested each refueling outage as justified in Refueling Outage Justification ROJ-1.

Installation of the strap-on flow meter on Train A and the Train B correlation factors are necessary to comply with the technical specification requirement to verify at least once per 18 months that each deep well pump is capable of pumping 550 gpm. The pumps are actually operated at or near this flowrate during the monthly test; however, flow is not ensured. According to NRC guidance in Position 1 of GL 89-04, to take credit for a full open exercise of a check valve, flow must be measured. Hence, the monthly test can only be considered a partial-stroke exercise.

Based on the measurement of flow in Train A and accounting for the other factors (i.e., motor amperage, common discharge basin, pump similarity), the correlation of flow for Train B should provide acceptable results to ensure design basis flow rate through the "B" pump discharge check valve. Therefore, the use of a correlation factor rather than direct flow measurement provides an acceptable level of quality and safety for IST of the Train B check valve.

The deferral to refueling outages for the full flow test (i.e., testing with measured flow) of the check valves is allowed by OM-10 when the testing can not be performed quarterly or during cold shutdown. Limitations in the design (i.e., no permanently installed flow meters), and in consideration of the burden involved in using the strap-on instrumentation, make it impractical to perform testing quarterly or during cold shutdown. An 18-month test frequency is consistent with a refueling outage frequency, though testing may be performed without regard to plant mode. Therefore, though the testing is actually performed monthly without flow measurement, the full-stroke exercise may be performed on an 18-month test frequency. The burden of requiring the licensee to use the portable flow meter each quarter has been considered. A partial-stroke test monthly and a full-stroke open test once per 18 months will provide adequate assurance of the operational readiness of the check valves.

3.8.4 Conclusion

The alternative means of measuring the flow through the Train B pump discharge check valve is authorized pursuant to 10 CFR 50.55a(a)(3)(i) based on the acceptable level of quality and safety provided by the alternative. The proposal to test with measured flow once per 18 months is granted pursuant to the provisions of 10 CFR 50.55a(f)(6)(i) based on the impracticalities of the design not including permanently installed flow instrumentation and the burden in using strap-on instrumentation quarterly.

3.9 Relief Request VR-8

Relief Request VR-8 is applicable to non-Code Class diesel generator air-start system valves.

3.9.1 Basis for Relief

The licensee states:

> The monthly Diesel Generator testing program, outlined in Byron Station's Technical Specifications and implemented by station operating procedures, exceeds the intent of the quarterly valve testing program which would be required by OM-10, Paragraph 4.2.1.2. Additionally, the stroke time of solenoid operated valves associated the Diesel Air Start System is impractical due to the fast actuation of these valves.
>
> Proper valve operation will be demonstrated on a monthly basis by the verification of diesel generator air start capability. Such verification will compare the air pressures contained in the receiver tanks both before and after the diesel generator start, thus verifying the operability of the air frequency satisfies the intent of the Section XI requirements without posing undue hardships or difficulties.

3.9.2 Alternative Testing

The licensee proposes:

> The performance of Byron Station's Diesel Generator operability monthly surveillance will verify the operational readiness of the valves associated with the Diesel Air Start System.
>
> This surveillance testing will require the recording [of] the air pressures contained in both trains A & B of the Diesel Generator Air Start Receiver Tanks both before and immediately after diesel generator start.
>
> By the comparison of these values between trains, the satisfactory operation of the power operated and self-actuated check valves associated with the Diesel Air Start System can be adequately demonstrated.

3.9.3 Evaluation

Because these valves are non-Code, deviations from the Code requirements are not subject to 10 CFR 50.55a. The NRC has indicated that non-Code components may be included in the IST program (reference Position 11 of GL 89-04) and tested in accordance with the Code requirements to monitor the condition of the components under an established program. In some cases, non-Code components may not include design features to test in accordance with the Code. In such cases, the licensee may document the alternative testing in the IST program. Hence, no further evaluation is required under 10 CFR 50.55a; rather, the testing is subject to 10 CFR Part 50, Appendix B, requirements.

4.0 CONCLUSION

Relief is granted for Relief Requests PR-1, VR-2 (in part), VR-3, VR-6, and VR-7 (in part) pursuant to 10 CFR 50.55a(f)(6)(i). The burden on the licensee has been considered in granting this relief. Alternatives proposed in Relief Requests VR-2 (in part), VR-4, VR-5, and VR-7 (in part) are authorized pursuant to 10 CFR 50.55a(a)(3)(i) or (a)(3)(ii). Relief Request VR-1 is denied for the reasons stated in the evaluation; however, the licensee may provide additional justification if it believes that the proposed alternative should be authorized. Relief Request VR-8 relates to components outside the scope of 10 CFR 50.55a; therefore, the licensee may implement the alternative without specific NRC approval.

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