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

COMMONWEALTH EDISON COMPANY

BYRON STATION, UNITS 1 AND 2

DOCKET NUMBERS 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 Class 1, 2, and 3 pumps and valves be performed in accordance with the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Section XI, and applicable addenda, except where alternatives have been authorized or relief has been requested by the licensee and granted by the Commission pursuant to Sections (a)(3)(i), (a)(3)(ii), or (f)(6)(i) of 10 CFR 50.55a. In proposing alternatives or requesting relief, the licensee must demonstrate that (1) the proposed alternatives provide an acceptable level of quality and safety; (2) compliance would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety; or (3) conformance is impractical for its facility. Section 50.55a authorizes the Commission to approve alternatives and to grant relief from ASME Code requirements upon making the necessary findings. NRC guidance contained in Generic Letter (GL) 89-04, "Guidance on Developing Acceptable Inservice Testing Programs," provides alternatives to the Code requirements determined acceptable to the staff. Alternatives that conform with the guidance in GL 89-04 may be implemented without additional NRC approval, but are subject to review during inspections. The NRC staff's findings with respect to authorizing alternatives and granting or not granting the relief requested as part of the licensee's IST program are contained in this safety evaluation (SE).

2.0 BACKGROUND

In its letter of September 8, 1995, Commonwealth Edison Company (ComEd, the licensee) submitted a revision to the IST Program for Pumps and Valves. Additional information was provided in a letter dated November 2, 1995. The IST program was established to Section XI of the 1983 Edition of the ASME Code for the first interval. The revision eliminated Relief Request PR-7 regarding vibration measurements for the essential service water makeup pumps and replaced it with a Technical Approach and Position PA-1. PA-1 implements the requirements of the 1989 Edition of Section XI, and by reference, Part 6 of the ASME Operations and Maintenance Standards, 1988a. The licensee's actions

Enclosure

are within the guidance of GL 89-04, Supplement 1, and NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants" for implementing certain portions of Part 6. No further NRC review is necessary as long as the vibration monitoring of these pumps is performed in accordance with Part 6 requirements; otherwise, approval of an alternative will be required.

Relief Request VR-28 was added to the program to document the use of GL 89-04, Position 2, for a sampling program for the main feedwater header check valves. Because the request indicates that the alternative to full flow testing will comply with the guidance in Position 2, no further NRC review is necessary; however, the implementation of the guidance is subject to NRC inspection. Three additional relief requests were included in the revision and are evaluated below.

3.0 RELIEF REQUEST PR-8

The licensee proposes to apply guidance from Draft NUREG-1482, dated November 1993. Guidance in the final NUREG-1482, issued April 1995, should be used rather than the guidance in the draft report. However, for the specific section reference in the relief request, the guidance in the final report is consistent with that issued in the draft report.

The relief request applies to the ASME Code Class 3 diesel fuel oil transfer pumps and relates to the tolerance around the reference values for the discharge pressure. IWP-3100 requires that the resistance of the system be varied until either the measured differential pressure (or here, the discharge pressure as approved per Relief Request PR-6) or the measured flow rate equals the corresponding reference value. NUREG-1482, Section 5.3, indicates that a tolerance of +/-2 percent of the reference value may be applied when the actual reference value can not be achieved and maintained at an exact value, but that if a wider tolerance than +/-2 percent is needed, specific approval is necessary and, in some cases, adjustments to the acceptance criteria are necessary.

3.1 Licensee's 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 have indicated consistent values in the past. The lowest discharge pressure reference 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% tolerance (as noted in NUREG 1482, section 5.3). For instance, in considering a reference value of 23 psig, the +/-2% 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% criteria, only a readability range of +/-0.25 psig would be possible (next higher reading of +/-0.5 psig would represent a tolerance > 2%). 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% 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.

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Discharge pressure for these positive displacement pumps [is] 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% 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% 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% to +/-4.3% of the existing reference values.

3.2 Proposed Alternative

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 IWP-3100-2 to ensure the measured value is within the necessary acceptable limits.

3.3 Evaluation

Section 5.3 of NUREG-1482 discusses guidance allowable variance from reference points and fixed-resistance systems. While the licensee's basis appears to address the issue of testing the diesel oil transfer pumps as a fixed-resistance system, the alternative requested is to allow for a greater than 2 percent tolerance around the reference value. The guidance in Section 5.3 recognized that a greater than 2 percent tolerance may be necessary depending on the precision of the instrument; however, it suggests that a corresponding adjustment to acceptance criteria may be made to compensate for the uncertainty, or an evaluation justifying the greater tolerance would be

performed. The licensee's basis for relief and proposed alternative do not discuss changes to the acceptance criteria. While the precision of the instruments could allow for a tolerance of no more than 0.25 psig, the proposed alternative is to use a tolerance of 1 psig.

The allowable tolerance was meant to be a provision for cases where it is impractical to achieve and maintain a reference value, yet the request does not indicate that obtaining consistent values is impractical. Therefore, a tolerance of 1 psig is not justified. Additionally, a tolerance within the precision of the instruments is within the 2 percent (i.e., 0.25 psig is smaller than 0.46 psig which is equivalent to 2 percent of the reference value).

3.4 Conclusion

The licensee should review the testing and determine if it is within the provisions of Paragraph 5.2(c) of OM-6 for a fixed-resistance system. If so, the testing may be performed in accordance with those provisions pursuant to GL 89-04, Supplement 1. If not, a tolerance of no more than 2 percent may be applied to the reference value. If the licensee believes that a tolerance of 1 psig is necessary for control of the testing, it may be applied only if the acceptance criteria are changed accordingly. The final actions taken by the licensee are to be documented in a revised relief request.

The staff recommends that the licensee consider which approach it wants the staff to review and resubmit it as a revision to the IST program for the second ten year interval which was submitted by letter dated December 22, 1995.

4.0 RELIEF REQUEST VR-29

Relief from the exercising frequency requirements of IWV-3522 for quarterly stroking of the essential service water makeup pump discharge check valves is proposed.

4.1 Licensee's 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 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.

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Nonintrusive techniques are considered to be "other positive means" in accordance with ASME Section XI IWV-3522. As described in NUREG 1482, noninstrusive 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:

a. 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.

b. The A and B SX makeup pump surveillances 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.

c. In addition, this 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, approximately one full day 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 surveillances.

4.2 Proposed Alternative

The licensee proposes:

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

4.3 Additional Information

In a letter dated October 31, 1995, the NRC requested additional information regarding the safety and risk significance of the failure of these valves to close, the maintenance history, and details on the scope of the time required to complete the testing in proportion to the other activities for which the acoustic engineer is involved. In its letter dated November 2, 1995, the licensee responded to the request for additional information, indicating that there are several mitigating factors if the check valves fail to close; that no maintenance has been performed on the valves since the plant has been

operational, but that the valves are being included in a preventative maintenance program that will periodically disassemble and inspect the valve internals; and that the full 8 days per year (1 day per quarter per valve) that the engineer expends on testing these valves impact the performance of other duties necessary to implement the check valve program for these and the remaining 500 valves in the program, as well as a review of an additional 2000 other check valves underway. In addition, the check valve engineer is responsible for the pressure testing program conducted to meet requirements of Section XI of the ASME Code.

4.4 Evaluation

The NRC encourages the use of nonintrusive techniques for testing check valves. Such techniques offer an actual indication of the movement of the valve obturator, verifying not only that the valve will pass the system fluid, but that the disk does, in fact, travel through the stroke and in this case, travels to the seat on cessation of flow. Therefore, the NRC considers that the use of such techniques is within the definition of "other positive means" for purposes of exercising check valves.

The test frequency required by IWV-3520 will be extended from quarterly to once per refueling outage. However, the extended frequency will apply only to testing performed using the acoustic monitoring techniques for verifying the reverse flow closing function of the valves. Quarterly exercising will continue for the forward flow exercising of these valves and in effect, the valves will travel to the closed position on cessation of flow, but the acoustic monitoring will not be performed during each quarterly test. The licensee indicates that the acoustic monitoring involves one full day of the engineering programs resources for each valve (i.e., a total of 8 full workdays per year). The historical performance of the valves indicates that the quarterly exercising has been effective in ensuring the operational readiness of the valves for approximately 10 years and that seven acoustic tests have indicated acceptable performance. The licensee has indicated that no maintenance has been performed on the valves over the service life of the plant, but that plans are to implement a periodic disassembly and inspection of these and other similar service water check valves.

The safety function of these valves in closing is to prevent drain down of the piping from the ultimate heat sink cooling water basins to the river screen house which is located at an elevation 200 feet below that of the basins and at a distance of approximately five miles from the plant. The makeup piping enters the basins at a level of approximately 50 percent which corresponds with the Technical Specification (TS) limiting condition for continued operation. If the check valves failed to close to prevent reverse flow, at least two other means of isolation could be effected, albeit via passive safety-related, but accessible, valves. Additionally, there are at least two additional means of makeup water supply to the cooling water basins. Therefore, failure of these valves to close will not result in a loss of inventory of the cooling water basins.

The purpose of maintaining water in the lines is to avoid a potential delay in transporting makeup water to the basins in a post-accident condition; however, the essential service water pumps receive an automatic start signal at 53 percent basin level. With the valves being capable of opening, sufficient suction pressure is available for the pumps and they would be able to supply water to the basins, even if there was a time delay to fill the length of piping that could have potentially drained down. Therefore, in light of the hardship in fully testing the valves closed each quarter, there is no compensating increase in the level of safety that is afforded by requiring the licensee to continue to use the acoustic equipment during each pump test. Continuing to perform the exercise each quarter, with a test once every 18 months verifying the capability of the valves to fully close, will provide an acceptable level of assurance of the operational readiness of the valves in the event an accident occurs. The proposed test frequency is not inconsistent with the frequency allowed by the 1989 Edition of the ASME Code when conditions for testing quarterly or during cold shutdowns are impractical.

4.5 Conclusion

Based on the hardship that results from imposition of the code requirement to test the essential service water makeup pump discharge check valves quarterly or during cold shutdown, without a compensating increase in the level of safety if the requirements were imposed, the alternative frequency of once every 18 months for verifying the capability of the valves to close is authorized pursuant to 10 CFR 50.55a(a)(3)(ii).

5.0 RELIEF REQUEST VR-30

An alternative procedure for exercising the deep well pump discharge check valves to the service water cooling towers is proposed. The valves are ASME Code Class 3 valves according to the valve table and are, therefore, subject to the IST requirements.

5.1 Licensee's Basis for Relief

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/OWW01PB) are physically inaccessible and were not designed or installed in accordance with ASME code and are not required as long as the Emergency SX [service water] 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 Technical Specification 3/4.7.5. The safety related check valves referenced in this 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 each 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.

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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 cannot 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.

5.2 Proposed Alternative

The licensee proposes:

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 up 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 with 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% 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%, 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.

5.3 Evaluation

The valves are partial-stroke exercised once every month during the pump surveillance performed in accordance with TS 4.7.5. The monthly exercise may be equivalent to a full-stroke exercise, but the flow is not measured. Because the "B" flow path does not have an area of sufficient length of pipe to use ultrasonic flow meters, the "A" pump is used to full-stroke exercise both of the check valves. Flow is measured in the "A" line using an ultrasonic flow meter and then the system is realigned for the "A" pump to supply the "B" line. The motor amperage is measured during both tests and is used to show that the flow through the "B" line is essentially equivalent to the measured flow through the "A" line. The use of motor amperage to show equivalency is based on the principle that if there is a load change in the pump (e.g., greater power required to pump against a higher resistance or to pump a greater volume of water), there would be a response in the motor; therefore, though the comparison does not indicate directly that the flow is the same, it can be considered similar if the motor amperage is set at essentially the same value. However, the licensee should document its evaluation of the comparison of the resistance of train "A" and train "B" to ensure similarity. If the throttle valves are located downstream of the train cross-connection, the licensee should also record the position of the throttle valve in the "B" line to ensure that it is at a comparable setting to the position of the throttle valve in the "A" line when 550 gpm was measured and acceptance criteria should be established for each meaningful parameter. The monthly testing performed with each pump at 100 percent power is essentially a full-flow test, but without flow measurement.

5.4 Conclusion

Based on the acceptable level of quality and safety that can be achieved by the testing that is essentially equivalent between trains during the eighteen month testing and the monthly 100 percent pump flow testing, the alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(i). The authorization is provisional upon the licensee ensuring the resistance between the trains is similar and, if the throttle valves are downstream of the train cross-connection, the position of the train "B" throttle valve is also set or recorded as part of the testing, with the appropriate acceptance criteria.

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