ENCLOSURE

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
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY, ET AL.
PERRY NUCLEAR POWER PLANT
DOCKET NUMBER 50-440

1.0 INTRODUCTION

The Code of Federal Regulations, 10 CFR 50.55a, requires that inservice testing (IST) of certain ASME Code Class 1, 2, and 3 pumps and valves be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel Code 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. 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 without further NRC review. Implementation of the GL 89-04 positions is subject to inspection.

Section 10 CFR 50.55a authorizes the Commission to approve alternatives and to grant relief from ASME Code requirements upon making the necessary findings. 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).

Furthermore, in rulemaking amendments to 10 CFR 50.55a effective September 8, 1992, (57 FR 34666), the 1989 edition of ASME Section XI was incorporated in 10 CFR 50.55a(b). The 1989 Edition states that the rules for IST of pumps and valves shall meet the requirements set forth in ASME Operations and Maintenance Standards Part 6 (OM-6), "Inservice Testing of Pumps in Light-Water Reactor Power Plants," and Part 10 (OM-10), "Inservice Testing of Valves in Light-Water Reactor Power Plants." Pursuant to 10 CFR 50.55a(f)(4)(iv), portions of editions or addenda may be used provided that all related requirements of the respective editions or addenda are met, and subject to Commission approval. Because the alternatives meet later editions of the Code, relief is not required for those inservice tests that are conducted in accordance with OM-6 and OM-10, or portions thereof, provided all related requirements are met. Whether all related requirements are met is subject to NRC inspection.

The IST program evaluated in this SE, covers the first 10-year IST interval for the Perry Nuclear Power Plant. The interval began November 19, 1987, and ends November 18, 1997. The first ten-year interval IST program is based on the requirements of the 1983 Edition, with summer 1983 Addenda, of the ASME Section XI Code. The first interval program was reviewed by the NRC and a safety

evaluation was issued April 5, 199 In a letter dated February 2, 1994, revised Relief Requests VR-26 and VR-35, and RO justifications RO-1 and RO-2, were submitted by the licensee for NRC review. These are evaluated below.

2.0 EVALUATION OF RELIEF REQUESTS

In the April 1993 SE, the NRC indicated that the licensee's basis for VR-26 was not adequate to justify the alternative test method and frequency for the subject valves. For VR-35, interim relief was granted to allow a period of time to investigate other methods of measuring the stroke time of the subject valves. These two relief requests have been revised to include the results of the licensee's further review.

2.1 Relief Request VR-26

For Code Class 2, Category C, keep-fill system check valves 1E12-F084A/B/C, 1E22-F007, and 1E51-F061, which function as keep-fill pump discharge check valves, relief is requested for the test frequency requirements of IWV-3521 and the test method of IWV-3522.

2.1.1 Licensee's Basis for Relief

The licensee states:

> These simple check valves are the outboard check of a series pair for the safety-related keep-fill pump discharge. They provide the high-to-low pressure interface to prevent overpressurization of the low pressure portion of the system.
>
> Both the associated inboard and involved outboard check valves are in close proximity to each other. At cold shutdown these valves are exercised open by verifying proper keep-fill system flow. The associated inboard stop check valves can be verified closed using the manual handwheel (in accordance with the guidance provided in the September 26, 1991, Supplement to the public meetings on Generic Letter 89-04). The system configuration does not include test connections between the involved outboard valves and their associated inboard stop check valves. Hence, the closure of the outboard check valves cannot be individually verified. The system would have to be redesigned and modified to perform the Code required testing. Disassembly and inspection of these valves on a sampling basis to assess their closure capability provides a reasonable alternative to the Code test method.
>
> The NRC staff previously accepted valve disassembly and inspection on a sampling basis as an alternative to full flow testing in Generic Letter 89-04, Attachment 1, Position 2. Due to the scope of the activity, the personnel hazards involved and system operating restrictions, this valve disassembly will be performed during reactor refueling outages. This deviation from the Code frequency is specifically permitted in the generic letter position.

2.1.2 Alternative Testing

The licensee proposes:

> A sample disassembly and inspection plan which is consistent with Generic Letter 89-04, Attachment 1, Position 2, will be utilized. This plan which selects one valve in each group to be disassembled every refueling outage will be utilized. Sample groups may consist of more than 4 valves; however, all valves within each group must be disassembled within a maximum of 4 refueling outages. These valves are exercised open following their assembly by verifying proper keep-fill pump flow.

2.1.3 Evaluation

Check valve back flow testing that is acceptable to the staff is described in Generic Letter (GL) 89-04, Attachment 1, Position 3, "Back Flow Testing of Check Valves," which states: "Verification that a Category C valve is in the closed position can be done by visual observation, by an electric signal initiated by a position-indicating device, by observation of appropriate pressure indication in the system, by leak testing or by other positive means." GL 89-04, Position 2, indicated that disassembly and inspection for verifying the closed position of check valves is considered an acceptable option when no other means is available. However, the staff has since incorporated the 1989 Edition of Section XI which references OM-10 as the rules for inservice testing of valves as noted in Section 1.0 above. Paragraph 4.3.2.4, "Valve Obturator Movement," of OM-10, lists the acceptable methods of verifying the movement of a check valve disc. Paragraph 4.3.2.4(c) states that "as an alternative...disassembly every refueling outage to verify operability of check valves may be used." The NRC has allowed a disassembly and inspection sampling program in Position 2 of GL 89-04 (similar valves grouped and disassembled and inspected on a rotating basis), as the licensee has proposed such that each valve in a group is disassembled and inspected within a maximum of four refueling outages or six years.

2.1.4 Conclusion

The licensee's proposal is in accordance with guidance delineated in Position 2 of GL 89-04; therefore, the relief request is approved pursuant to GL 89-04 which states that "[p]rovided the provisions of this letter are followed, the staff has determined that relief is granted to follow the alternative testing delineated in positions 1, 2, 6, 7, 9, and 10, pursuant to 10 CFR 50.55a(g)(6)(i), is authorized by law, and will not endanger life or property or the common defense and security and is otherwise in the public interest." The implementation of the guidance is subject to NRC inspection.

2.2 Relief Request VR-35

For Code Class 2, Category A and B containment vessel and drywell purge valves 1M14-F040/F090/F190/F195/F200/F205, which function as containment isolation valves, relief is requested from the requirements of IWV-3417(a), "Corrective Action," to increase the test frequency when an increase in the stroke time occurs.

2.2.1 Licensee's Basis for Relief

The licensee states:

These large (18 inch and 42 inch) air-operated butterfly valves are provided with mechanical (50%) stops, and currently have a maximum stroke acceptance criteria for operability of 4 seconds.

These valves, although they close quickly, do not meet the GL 89-04, Position 6, application of "rapid-acting valves," therefore the Code specified "50% increase in stroke time" corrective action requirement would apply to these valves unless this requested relief is granted. A nominal time for the stroke of one of these valves is approximately 2 seconds, such that an increase of 50% from this time (to approximately 3 seconds) would require increased testing and corrective action as specified by the Code.

At PNPP, a stroke time is measured (in tenths of seconds) utilizing the normal stroke time test method from control switch actuation to limit switch light energization. The quarterly measurements of stroke times for these valves are subject to deviations in air system pressure, valve ambient conditions, normal stroke deviations, in addition to variations in human reflexes. Although the human reflex parameter could be eliminated through application of a more complex electronic timing methodology, this would not preclude the occurrence of normal stroke time deviations greater than 50%, which does not indicate actual valve degradation. This has been demonstrated at PNPP, since measured stroke times for these valves have historically been observed to increase greater than 50% from the reference value, with subsequent valve disassembly and inspections showing no significant valve degradation.

Exceeding the reference value by 50% requires the test frequency to be increased to monthly. Excessive cycling (exercising) of these valves will cause unnecessary wear and can result in increased seat leakage. The consequential increased leakage could lead to a plant shutdown which would otherwise not have been necessary. These valves have their seat leakage measured on a quarterly frequency as specified by the PNPP Technical Specifications.

The existing 4-second maximum stroke time will be used to declare the valve inoperable per IWV-3417(b). However, since increased frequency testing can cause valve seat deterioration through excessive cycling, IWV-3417(a) which requires an increased test frequency of once per month for valves with an increase in stroke time of 50% from the reference value will not be followed.

2.2.2 Alternative Testing

The licensee proposes:

Valve stroke times will be monitored and trended. When valve stroke times exceed the maximum allowable stroke time of 4 seconds, the valve will be declared inoperable and repaired or replaced.

2.2.3 Evaluation

IWV-3413 of Section XI of the Code requires that the stroke times of power-operated valves be measured to at least the nearest second for valves with stroke times of 10 seconds or less. Full-stroke time is that time interval from initiation of the actuating signal to the end of the actuating cycle. From the licensee's description of the stroke timing of the containment purge valves, the stroke times are measured using stop watches and monitoring indicating lights. Stroke time measurements are taken quarterly. The corrective action requirements of IWV-3417 specify that for valves with full-stroke times of 10 seconds or less that exhibit an increase in stroke time of 50% or more from the previous test, test frequency shall be increased to once each month until corrective action is taken.

SAR Section 9.4.6.3.3, "Containment Vessel and Drywell Purge System," indicate that the containment purge isolation valves are pneumatically-operated butterfly type valves which are bubble tight at rated pressure and temperature, capable of satisfactory operation even after long periods of inactivity and/or infrequent operation. The valves are held closed by spring force. If a loss-of-coolant accident (LOCA) occurs while these valves are open, the actuator solenoid valves are automatically de-energized allowing the spring to shut the valve (fail safe closed). The valves are quick-closure types capable of full closure in four seconds at peak temperature against the full pressure of the containment during a LOCA. The containment purge system operates intermittently during reactor operation to reduce the containment airborne activity. The 42" inboard valves remain closed during purging operation, except during refueling outages. The 18" bypass line valves and the outboard 42" valve open for purging during reactor operation. The effective 18" penetration offers a much smaller opening between the containment atmosphere and the outside environs, reducing potential leakage of the containment atmosphere following all containment ventilation isolation.

Radiological consequences of a postulated LOCA during containment purge system operation are discussed in SAR Section 6.2.4.2.3, "Consideration of NRC Branch Technical Position CSB 6-4, 'Containment Purging during Normal Operation'." A major assumption used in the dose analysis is that the purge system isolation valve closure will isolate containment within five seconds (includes valve closure time of four seconds and an additional maximum time of one second for conservatism). Constant flow rates through the open purge lines corresponding to the maximum containment pressure of approximately 3.0 psid during the release period (5 seconds) was assumed.

Inservice testing (IST) does not ensure that a component will perform its function during design-basis conditions. Current IST requirements are based on the premise that the tested components have been designed to function under the design-basis conditions and that verification has been performed either through startup testing or a combination of testing and analysis. IST generally monitors the condition of a pump or valve from a baseline condition established when the component was known to be operating acceptably. For valve stroke time monitoring under Subsection IWV, the stroke time results of each test are compared to the previous test to identify degrading trends. In Position 6 of GL 89-04, the NRC specified an acceptable alternative to these trending requirements for "rapid-acting" valves (operate in two seconds or less). OM-10 also includes provisions for valves which stroke in two seconds or less.

The purge valves stroke "rapidly," though not in less than two seconds. The closing force is provided by a spring. Significant changes in the stroke time would be due to changes in the bleed-off rate of the air pressure which holds the valve disc in the open position, relaxation in the spring (or improper bench set during maintenance), or over-tightening of valve stem packing. These conditions are generally constant, or changing at an unmeasurable rate, during plant operating conditions unless valve maintenance is performed (which would require post-maintenance inservice testing). Therefore, it is likely that any changes indicated during stroke timing would be due to the test method or human reflexes in using the stop watch. While introductions of these types of uncertainties is not a reason, alone, to perform IST improperly or not in accordance with the Code, the conventional method of stroke timing valves is the method the licensee describes. It is only with recent technological changes that alternative means of measuring stroke times of power-operated valves to milliseconds became available. The valves generally stroke in a range between two and three seconds. Meeting the Code requirement to measure to the nearest second, the 50% increase would be one second to 1.5 seconds. With the historical data indicating that a change in the stroke time from two to three seconds did not identify actual degrading conditions, based on the corrective actions taken, it would be an unnecessary hardship to require increased testing (monthly) or unnecessary maintenance when the measured stroke time is within a range that indicates acceptable operation. Subjecting the valves to additional tests could potentially damage the valve seating surfaces, as butterfly valves move into the seat with a "wiping" motion. By measuring to the nearest second, any change that is above the normal range of two to three seconds would be evaluated and corrective actions taken as necessary. Therefore, there would be no compensating increase in safety in imposing the requirements of IWV-3417 to increase the test frequency to monthly until corrective actions are taken.

The purge valves are stroke time tested quarterly. Though the relief request does not state the test conditions, it is unlikely that the test is conducted with a pressure differential of 3 psid (design-basis differential pressure) across the valves. The licensee notes several factors involved in the regular IST stroke timing that cannot be, or are not tightly controlled during the test, indicating that the uncertainties could not be eliminated without the use of complex electronic timing methodology. With the current method of stroke timing these valves, the licensee should record and trend the measurements to the nearest second due to the deviations that could occur from test to test. This testing, along with the assignment of a 4-second limiting stroke time, will

enable the licensee to monitor the valves for any gross changes in stroke times and will require corrective actions when the stroke time exceeds four seconds. Actions would be taken to assess any stroke time of 3.5 seconds or above. However, assigning a limiting stroke time of four seconds at test conditions less than design-basis conditions does not ensure that the valves will perform their design-basis function, which, as noted above, is not the intent of IST. As such, the licensee should ensure that these valves previously have been verified to be capable of performing their design-basis function.

Additionally, periodic testing performed in a controlled manner using electronic equipment such as an air-operated valve diagnostic system should be considered by the licensee to verify that the valves can continue to perform their design-basis function to close within four seconds against a differential pressure of 3 psid. The OM standard for motor-operators on valves, Part 8, specifies that the period for more extensive testing shall be established by the owner, but shall not exceed six years. The draft OM guide for pneumatically-operated valve assemblies, Part 19, similarly recommends a period for more extensive testing not to exceed six years. Because this is beyond the requirements of inservice testing, it is a recommendation only and the licensee is not required to respond, though actions taken to address the recommendation may be reviewed during a future NRC inspection.

2.2.4 Conclusion

The proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(ii). Establishing a limiting stroke time of four seconds (3.5 or above rounding to the nearest second) will allow a range of approximately 1.5 seconds to 3.5 seconds (rounding to the nearest second) as a normal range for stroke times of the containment purge valves for IST. Evaluation or corrective actions would be required if the measured stroke time is 3.5 seconds or above. Requiring increased testing for an increase that would fall within the 1.5 - 3.5 second range would result in a hardship without a compensating increase in the level of quality and safety.

3.0 REFUELING OUTAGE JUSTIFICATIONS

The licensee has indicated its intent to use Paragraph 4.3.2 of OM-10 for deferral of valve exercising to refueling outages for certain check valves which cannot be exercised during power operations or cold shutdown conditions. When practical, part-stroke exercising during power operations or cold shutdown is performed. Refueling Outage Justifications RO-1 and RO-2 have been developed for describing the basis for the testing deferral to refueling outages. The NRC approves the licensee's request to use the specified portion of OM-10 pursuant to 10 CFR 50.55a(f)(4)(iv). The documentation requirements of Paragraph 6.2 of OM-10 are related requirements that are met by including RO-1 and RO-2 in the IST program document. The basis described in RO-1 and RO-2 for the deferred testing appears adequate; however, each cold shutdown or refueling outage justification is subject to further review during NRC inspections.

4.0 CONCLUSION

The staff concludes that the relief requests evaluated in this SE will provide reasonable assurance of the operational readiness for the applicable valves to perform their safety-related functions. The staff has determined that granting relief pursuant to GL 89-04, authorizing an alternative pursuant to 10 CFR 50.55a (a)(3)(ii), and approving the use of portions of later editions of the Code pursuant to 10 CFR 50.55a(f)(4)(iv) are authorized by law and will not endanger life or property, or the common defense and security and is otherwise in the public interest. In making this determination, the staff has considered the burden on the licensee if the Code requirements were imposed.

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