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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO ASME CODE CASE N-416-1 (RR-17)

PHILADELPHIA ELECTRIC COMPANY

LIMERICK GENERATING STATION, UNIT 2

DOCKET NO. 50-353

1.0 INTRODUCTION

The Technical Specifications for Limerick Generating Station (LGS), Unit 2, state that the inservice inspection and testing of the American Society of Mechanical Engineers (ASME) Code Class 1, 2, and 3 components shall be performed in accordance with Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," of the ASME Boiler and Pressure Vessel Code and applicable Addenda as required by 10 CFR 50.55a(g), except where specific written relief has been granted by the Commission, pursuant to 10 CFR 50.55a(g)(6)(i). As stated in 10 CFR 50.55a(a)(3), the alternatives to the requirements of paragraph (g) may be used, when authorized by the U.S. Nuclear Regulatory Commission (NRC), if (i) the proposed alternatives would provide an acceptable level of quality and safety or (ii) compliance with the specified requirements would result in hardship or unusual difficulties without a compensating increase in the level of quality and safety.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that inservice examination of components and system pressure tests conducted during the first ten-year interval and all subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(b) on the date twelve months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein.

The applicable edition of Section XI of the ASME Code for the LGS, Unit 2, second 10-year inservice inspection (ISI) Interval is the 1986 Edition. The components (including supports) may meet the requirements set forth in subsequent editions and addenda of the ASME Code incorporated by reference in 10 CFR 50.55a(b) subject to the limitations and modifications listed therein and subject to Commission approval.

By letter dated September 27, 1994, Philadelphia Electric Company (licensee) submitted RR-17 requesting approval for the implementation of the alternative rules of ASME Section XI Code Case N-416-1, dated February 15, 1994, entitled "Alternative Pressure Test Requirement for Welded Repairs or Installation of

Replacement Items by Welding, Class 1, 2, and 3, Section XI, Division 1." The licensee specifically requested to apply the alternative requirements of ASME Code Case N-416-1 to the Inservice Inspection (ISI) program for the 2" Class 1 Main Steam Isolation Valve Leakage Control System piping (Lines DBA-211), associated with Modification P00017.

The NRC staff has reviewed and evaluated the licensee's request and supporting information to use Code Case N-416-1 as a proposed alternative to the ASME Code requirements for LGS, Unit 2.

2.0 EVALUATION

2.1 Component Identification

RR-17, ASME Class 1 Piping in the Main Steam Isolation Valve Leakage Control System

2.2 ASME Code Section XI Second Interval Requirements

The ASME 1986 Edition, Section XI, IWA-4400 (a) requires that a system hydrostatic test be performed in accordance with IWA-5000, after repairs by welding, or the installation of replacement items by welding, on Class 1 components.

2.3 Licensee's Basis for Request

The licensee stated that the hydrostatic testing following the repair or replacement of main steam line and standby liquid control system components imposes an undue hardship for the following reason:

> Modification P00017 requires the cutting and capping of each four existing 2" Main Steam Isolation Valve Leakage Control System pipes, near their connection to the Main Steam piping (between containment isolation valves). The weld joining the cap to the remaining pipe stub requires a Section XI hydrostatic test. Because of the configuration of piping in this area, this weld cannot be appropriately isolated from the remainder of the Class 1, Main Steam Piping System. (e.g. using the Main Steam Isolation valves as the test boundary valves could result in damage to the inboard valve, due to pressurization under the valve disc). This would then require pressurization of the entire Class 1 boundary to the required hydrostatic test pressure of IWB-5222 (1.08 times the nominal operating pressure corresponding with 100% rated reactor power, when tested at 200°F).
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> The burden imposed by the described situation is not commensurate with the increased level of safety yielded by the higher pressures associated with the hydrostatic test as compared to the pressures associated with the normal system leakage test (e.g. 1085 psig vs. 1005 psig). Therefore, this specific request is made for permission to use ASME Section XI Code Case N-416-1, to satisfy the requirements for the post-repair pressure testing of this modification.

2.4 Proposed Alternative Examination

The licensee proposes to apply Code Case N-416-1 as an alternative for the post repair/replacement hydrostatic test requirement, as follows:

> The subject weld will be pressure tested during the conduct of the routine Class 1 leakage test, which will be conducted at the end of the refueling outage. The test pressure associated with this test is the nominal operating pressure associated with 100% rated reactor power. The test temperature used will be the normal Class 1 leakage test temperature. Additionally, the construction Code NDE performed on the subject welds will be in accordance with the methods and acceptance criteria of the 1992 Edition of ASME Section III.
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> Use of the Code Case will be documented on the NIS-2 Form associated with this repair activity.

2.5 Evaluation

In lieu of hydrostatic pressure testing for welded repairs or installation of replacement items by welding, Code Case N-416-1 requires a visual examination (VT-2) be performed in conjunction with a system leakage testing using the 1992 Edition of Section XI, in accordance with paragraph IWA-5000, at nominal operating pressure and temperature. This code case also specifies that NDE of the welds be performed in accordance with the applicable subsection of the 1992 Edition of Section III.

The 1989 Edition of Sections III and XI are the latest editions referenced in 10 CFR 50.55a. The staff has compared the system pressure test requirements of the 1992 Edition of Section XI to the requirements of IWA-5000 of the 1989 Edition of Section XI. In summary, the 1992 Edition imposes a more uniform set of system pressure test requirements for Code Class 2 systems. The terminology associated with the system pressure test requirements for Code Class 2 has been clarified and streamlined. The test frequency and test pressure conditions associated with these tests have not been changed. The hold times for these tests has either remained unchanged or increased. The corrective actions with respect to removal of bolts from leaking bolted connections has been relaxed in the 1992 Edition, but use of this change has been accepted by the staff in previous safety evaluations. The post-welded repair NDE requirements of the 1992 Edition of Section III remain the same as the requirements of the 1989 Edition of Section III. Therefore, the staff finds this aspect of Code Case N-416-1 to be acceptable.

Hardships are generally encountered with the hydrostatic tests performed in accordance with the Code. For example, since hydrostatic test pressure would be higher than the nominal operating pressure, hydrostatic pressure testing frequently requires significant effort to set up and perform. The need to use special equipment, such as temporary attachment of test pumps and gages, and the need for individual valve lineups can cause the testing to be on a critical path.

Piping components are designed for a number of loadings that would be postulated to occur under the various modes of plant operation. Hydrostatic testing only subjects the piping components to a small increase in pressure over the design pressure and, therefore, does not present a significant challenge to pressure boundary integrity. Accordingly, hydrostatic pressure testing is primarily regarded as a means to enhance leakage detection during the examination of components under pressure, rather than solely as a measure to determine the structural integrity of the components.

The commercial electric power industry indicates that experience has demonstrated that leaks are not being discovered as a result of hydrostatic test pressures propagating a preexisting flaw through wall. They indicate that when leaks are found, in most cases, they are found when the system is at normal operating pressure. This is due largely to the fact that hydrostatic pressure testing is required only upon installation and then once every 10-year inspection interval, while system leakage tests at nominal operating pressures are conducted a minimum of once each refueling outage for Class 1 systems. In addition, leaks may be identified by plant operators during system walkdowns, which may be conducted as often as once a shift.

Following the performance of welding, the code requires volumetric examination of repairs or replacements in Code Class 1 components. Considering the NDE performed on Code Class 1 systems and considering that the hydrostatic pressure tests rarely result in pressure boundary leaks that would not occur during system leakage tests, the staff believes that increased assurance of the integrity of Class 1 welds is not commensurate with the burden of performing hydrostatic testing.

The staff concludes that compliance with the code hydrostatic testing requirements for welded repairs or replacements of Code Class 1 components would result in hardships without a compensating increase in the level of quality and safety. Accordingly the licensee's proposed alternative to use Code Case N-416-1 is authorized for LGS, Unit 2, pursuant to 10 CFR 50.55a(a)(3)(ii).

3.0 CONCLUSION

The staff concludes that compliance with the Code hydrostatic testing requirements for welded repairs or replacements of Code Class 1 components described in RR-17 would result in hardships without a compensating increase in the level of quality and safety. Accordingly the licensee's proposed alternative to use Code Case N-416-1 for the components described in RR-17 is authorized for the LGS, Unit 2, pursuant to 10 CFR 50.55a(a)(3)(ii).

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Date: February 1, 1995