ENCLOSURE 1

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
OF THE APPROVAL OF ASME CODE CASE N-416-1 AS AN ALTERNATIVE
TO THE REQUIRED HYDROSTATIC PRESSURE TEST
FOR
FLORIDA POWER AND LIGHT COMPANY
ST. LUCIE NUCLEAR PLANT, UNITS 1 AND 2
DOCKET NUMBERS: 50-335 AND 50-389

1. INTRODUCTION

The Technical Specifications for St. Lucie Units 1 and 2 state that the inservice inspection (ISI) 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 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). 10 CFR 50.55a(a)(3) states that alternatives to the requirements of paragraph (g) may be used, when authorized by the 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 that become effective subsequent to editions specified in 10 CFR 50.55a(g)(2) and (g)(3), except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," 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 10-year interval and 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 12 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 St. Lucie Unit 1 second 10-year ISI interval is the 1983 Edition through summer 1983 addenda. The applicable edition of Section XI of the ASME Code for the St. Lucie Unit 2 second 10-year ISI interval is the 1989 Edition.

Pursuant to 10 CFR 50.55a(g)(5)(iii), if the licensee determines that conformance with an examination requirement of Section XI of the ASME Code is impractical for its facility, information should be submitted to the Commission in support of that determination. After evaluation of the determination, pursuant to 10 CFR 50.55a(g)(6)(i), the Commission may grant relief and may impose alternative requirements that are determined to be authorized by law; will not

endanger life, property, or the common defense and security; and are otherwise in the public interest, giving due consideration to the burden upon the licensee that could result if the requirements were imposed.

By a letter dated November 7, 1995, Florida Power and Light Company (FPL) requested approval of Relief request Nos. 19 and 20 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," pursuant to 10 CFR 50.55a(a)(3) to be applied to the ISI program for St. Lucie Units 1 and 2.

2.0 EVALUATION:

CODE CASE N-416-1 ALTERNATIVE PRESSURE TEST REQUIREMENT FOR WELDED REPAIRS OR INSTALLATION OF REPLACEMENT ITEMS BY WELDING CLASS 1, 2, and 3 - SECTION XI, DIVISION 1

Component Identification

ASME Code Class 1, 2, and 3 Piping Systems

ASME Code Section XI Third Interval Requirements

The 1983 Edition through the 1989 Edition, Section XI, IWA-4400(a) requires that a system hydrostatic test be performed in accordance with IWA-5000 after repairs by welding on the pressure retaining boundary.

Licensee's Basis for Request

"Code hydrostatic tests subject the piping system to a small increase in pressure over the nominal operating pressure and are not intended to present a significant challenge to pressure boundary integrity. It is used primarily as a means to enhance leakage detection during the examination of components under pressure, rather than a measure to determine the structural integrity of components.

"Industry experience has demonstrated that leaks are not being discovered as a result of hydrostatic test pressures propagating a pre-existing flaw through wall. Most leaks are being found when the system is at normal operating pressure. Hydrostatic tests are time consuming, require extensive operator support, and usually mean radiation exposure to personnel. Often additional equipment must be brought in to test a localized repair/replacement, which may involve additional exposure and expense. In many cases, a system hydrostatic test must be conducted over large parts of the system.

"Hydrostatic tests place a burden on the systems, increase radiation exposure and costs, require significant setup time, and add marginal value (if any) to the repair or replacement quality. These tests result in hardships without a compensating increase in the level of quality and safety. Performing the tests in accordance with the proposed alternative will provide reasonable assurance that flaws will be discovered."

Proposed Alternative Examination

The licensee proposes to apply Code Case N-416-1 as alternative rules for welded repairs or installation of replacement items by welding in Class 1, 2, and 3 piping systems. In addition, the licensee proposes to perform surface examinations of the root pass layer of butt and socket welds on the pressure retaining boundary of Class 3 piping and components.

Evaluation/Conclusions

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 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 nondestructive examination (NDE) of the welds be performed in accordance with the applicable Subsection of the 1992 Edition of Section III.

The 1989 Edition of Sections XI and III 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 1, 2, and 3 systems. The terminology associated with the system pressure test requirements for all three Code classes has been clarified and streamlined. The test frequency and test pressure conditions associated with these tests have not been changed. The hold time or operation time for system leakage tests has been increased. Although the corrective actions with respect to removal of bolts from leaking bolted connections has been relaxed in the 1992 Edition, this relaxation 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 performance of hydrostatic testing performed in accordance with the Code. The staff finds that 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 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. As such, 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 industry experience has demonstrated that leaks are not being discovered as a result of hydrostatic test pressures propagating a preexisting flaw through wall. This experience indicates that leaks in most cases are being found when the system is at normal operating pressure. This is largely due 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 and each 40-month inspection period for Class 2 and 3 systems. Leaks may also be found, during system walk downs by plant operators which occur as often as once a shift, when the system has been in operation and under normal system pressures for a length of time that is much longer than the hold times required for a hydrostatic test. This experience demonstrates that a slightly higher pressure imposed on the pressure boundary components during a hydrostatic testing may produce only a minor improvement in leak detection capability over a nominally pressurized system. This minor improvement of leak detection capability does not offset or justify certain hardships created in setting up a hydrostatic test due to a slightly higher test pressure.

Following the completion of welding, the Code requires volumetric examination of repairs or replacements in Code Class 1 and 2, but would also allow only a surface examination of the final weld pass in Code Class 3 piping components. There are no NDE requirements for Code Class 3 components except for visual examination for leaks in conjunction with the 10-year hydrostatic tests and the periodic pressure tests.

Considering the NDE performed on Code Class 1 and 2 systems and considering that the hydrostatic pressure tests rarely result in pressure boundary leaks that would not occur during system leakage tests at slightly lower test pressures, the staff believes that increased assurance of the integrity of Class 1 and 2 welds is not commensurate with the burden of performing hydrostatic testing. However, considering the nature of NDE requirements for certain Code Class 3 components, the staff does not believe that the requirement

in Code Case N-416-1 of only performing system leakage testing is an acceptable alternative unless additional surface examinations on the root (pass) layer of butt and socket welds are performed on the pressure retaining boundary of Class 3 components when the surface examination method is used in accordance with the 1992 Edition of ASME Code Section III. In its November 7, 1995, letter, the licensee proposed and committed to perform this additional examination. The staff finds this commitment acceptable.

For clarification, it should be noted that, consistent with the Code Case requiring performance of NDE in accordance with the methods and acceptance criteria of the 1992 Edition of Section III, the scope of examination should also be in accordance with the 1992 Edition of Section III. The additional surface examination of the root layer of Class 3 pressure retaining welds should be performed only when those pressure retaining welds are required to have a surface examination performed in accordance with the 1992 Edition of Section III. Therefore, the staff finds the licensee's proposal, that for those Class 3 welds receiving radiography no additional surface examination of the root layer needs to be performed, acceptable.

The licensee's alternative includes exceptions to Code Case N-416-1. One exception is the use of the VT-2 certification requirements of the 1989 Edition of ASME Section XI instead of the 1992 Edition. The staff's position is that it was the intent of Code Case N-416-1 to require use of the 1992 Edition of Section XI for the pressure test variables alone, and not for a separate VT-2 program. Therefore, the exception is not required. However, Code Case N-416-1 requires the system leakage test and associated VT-2 visual examination be performed in accordance with the 1992 Edition of ASME Section XI. As such, all requirements of IWA-5000 of the 1992 Edition of Section XI, including the 10-minute hold time for non-insulated components, and 4-hour hold time for insulated components must be met. Furthermore, Code Case N-416-1 adds the additional requirement that the system leakage test be performed at nominal operating pressure and temperature.

The staff concludes that compliance with the code hydrostatic testing requirements for welded repairs or replacement of Code Class 1, 2, and 3 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 St. Lucie Unit Nos. 1 and 2, pursuant to 10 CFR 50.55a(a)(3)(ii). Use of Code Case N-416-1 is authorized for the duration of the currently approved ISI plan provided 1) that the proposed surface examinations on the root (pass) layer of butt and socket welds are performed on the pressure retaining boundary of Class 3 components when the surface examination method is used in accordance with the 1992 Edition of ASME Code Section III, 2) that the system leakage tests are performed at nominal operating pressure and temperature, and 3) that all requirements of IWA-5000 of the

1992 Edition of Section XI, including the 10-minute hold time for non-insulated components, and 4-hour hold time for insulated components are met.

Principal Contributor: J. Huang

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