



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

CAROLINA POWER & LIGHT COMPANY

ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2

DOCKET NO. 50-261

1.0 INTRODUCTION

The Technical Specifications for Robinson Steam Electric Plant, Unit No. 2 (HBR), 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 (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 that become effective subsequent to editions specified in 10 CFR 50.55a(g)(2) and (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 the Code for HBR, third 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.

Pursuant to 10 CFR 50.55a(g)(5), if the licensee determines that conformance with an examination requirement of Section XI of the ASME Code is not practical for its facility, information shall be submitted to the Commission in support of that determination and a request made for relief from the ASME Code requirement. After evaluation of the determination, pursuant to 10 CFR 50.55a(g)(6)(i), the Commission may grant relief and may impose

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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 letter dated March 31, 1995, as supplemented April 28, 1995, Carolina Power & Light Company (licensee) requested 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," pursuant to 10 CFR 50.55a(a)(3)(ii).

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 HBR.

2.0 BACKGROUND

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 Class 1, 2, and 3 Piping Systems

ASME Code Section XI Third Interval Requirements

The 1986 Edition, Section XI, IWA-4700(a) requires after repairs by welding on the pressure retaining boundary, a system hydrostatic test shall be performed in accordance with IWA-5000.

Licensee's Basis for Request

The licensee states in its letter dated April 28, 1995:

If required hydrostatic testing following welded repairs and installation of replacement items by welding is impractical, it is currently necessary to defer the testing or to request relief from ASME Code required tests. Impracticality of testing may be the result of various situations, ranging from boundary valve isolation problems to incorporation of steam generators within the hydrostatic test boundary, as is the case in two specific items in our current pending request.

The licensee states further:

Additionally, hydrostatic testing is often impractical to perform following repair or replacement activities. Experience has demonstrated that leaks are not being discovered as a result of hydrostatic test pressures propagating a preexisting through-wall flaw. Typically, when leaks are identified, they occur at flanges, packing, seals, etc., whether at hydrostatic test pressure or normal operating pressure.

Frequently, situations that require welded repairs and installation of replacement items by welding are unexpected and are often identified only during the performance of in-service inspections. In such cases, it is necessary to request ASME Code relief on an expedited basis to avoid startup delays or exceeding limiting conditions of operation.

Code Case N-416-1 provides increased testing flexibility and can considerably reduce, or eliminate relief requests associated with welded repairs or installation of replacement items by welding. This is accomplished while maintaining an acceptable level of quality and safety.

Use of hydrostatic test deferrals, which are presently allowed in the current Code Case N-416 for Class 2 components, endorsed in Regulatory Guide 1.147, are not an appropriate solution because the test must be eventually performed, and it is the performance of the test itself that is burdensome. Deferred hydrostatic testing requirements should be assessed considering that the ten-year hydrostatic test is no longer required due to the NRC endorsement of Code Case N-498, "Alternate Rules for 10 Year Hydrostatic Pressure Testing for Class 1 and 2 Systems Section XI, Division 1," and potentially N-498-1 which would include Code Class 3 components if approved by the NRC.

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.

3.0 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 Editions of Sections XI and III are the latest editions referenced in 10 CFR 50.55a. The NRC 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 times for these tests have either remained unchanged or increased. The corrective actions with respect to removal of bolts from leaking bolted connections have been relaxed in the 1992 Edition, and this relaxation has been accepted by the NRC 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 NRC 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. For example, since hydrostatic test pressure would be higher than nominal operating pressure, hydrostatic pressure testing frequently requires significant effort to set up and perform. The need to use special equipment, such as the 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 subjects the piping components to only 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 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 in 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 Class 3 systems. In addition, leaks may be identified by plant operators during system walkdowns that 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 and 2, but would also allow only a surface examination of the final weld pass in Code Class 3 piping components. Except for visual examination for leaks in conjunction with the 10-year hydrostatic tests and the periodic pressure tests, ongoing NDE is not required for Code Class 3 components.

Considering the NDE performed on Code Class 1 and 2 systems and considering, as well, that the hydrostatic pressure tests rarely result in pressure boundary leaks that would not occur during system leakage tests, the NRC staff has concluded that increased assurance of the integrity of Class 1 and 2 welds is not commensurate with the burden of performing hydrostatic testing. However, in view of the nature of NDE requirements for Code Class 3 components, the NRC staff does not believe that elimination of the hydrostatic pressure testing while only performing system pressure testing is an acceptable alternative to hydrostatic testing, unless additional surface examinations in accordance with the methods of Section III are performed on the root pass layer of butt and socket welds on the pressure retaining boundary of Class 3 components.

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. No additional surface examination of the root layer need be performed for those Class 3 welds receiving radiography in lieu of a surface examination in accordance with Section III of the Code.

4.0 CONCLUSION

The NRC staff concludes that compliance with the Code-required hydrostatic testing requirements for welded repairs or replacements of Class 1, 2, and 3 components would result in hardship without a compensating increase in the level of quality and safety. Accordingly, the licensee's proposal to use Code Case N-416-1 as an alternative is authorized for HBR pursuant to 10 CFR 50.55a(a)(3)(ii), provided the additional surface examinations are performed on the root pass layer of butt and socket welds on the pressure retaining boundary of Class 3 components when the surface examination method is used in accordance with Section III. Use of Code Case N-416-1, with the additional surface examination as noted above, is authorized for the duration of the currently approved ISI program plan interval.

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