



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
SECOND 10-YEAR INTERVAL INSERVICE INSPECTION PLAN
REQUEST FOR RELIEF NO. 22 FOR
FLORIDA POWER AND LIGHT COMPANY
ST. LUCIE PLANT, UNIT 2
DOCKET NUMBER 50-389

1.0 INTRODUCTION

By letters dated February 18, and May 24, 1999, Florida Power and Light Company (the licensee), requested relief from certain ultrasonic testing (UT) examination requirements at St. Lucie Plant, Unit 2 (St. Lucie). The licensee proposed implementing the criteria from the American Society of Mechanical Engineers (ASME) Code Case (CC) N-622, "Ultrasonic Examination of RPV and Piping and Bolts and Studs, Section XI, Division 1," Chapters A.2, A.3, and B-1000 through B-5000 inclusive and Supplements 1, 4, 5A, 6, 7, and 13 as an alternative to the prescriptive UT examination requirements in the ASME Boiling and Pressure Vessel Code (Code). CC N-622 provides criteria for UT examination coverage and for UT performance-based qualifications of procedures, equipment, and personnel.

2.0 BACKGROUND

Pursuant to Title 10, Code of Federal Regulations (10 CFR), Section 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) must meet the requirements, except design and access provisions and preservice examination requirements, set forth in Section XI of editions of the Code and Addenda that become effective subsequent to the editions specified in paragraphs (g)(2) and (g)(3) of this section and that are incorporated by reference in 50.55a(b), to the extent practical within the limitations of design, geometry and materials of construction of the components.

2.1 Code Requirements

The applicable edition of Section XI of the Code for St. Lucie for the second ten-year interval is the 1989 Edition with no addenda. St. Lucie is required to perform volumetric examinations of the pressure-retaining welds in the reactor vessels (RVs) according to IWB-2500-1, Examination Category B-A and full penetration welded nozzles in RVs according to IWB-2500-1, Examination Category B-D. When using UT for volumetric examinations, IWA-2232 states that UT examinations shall be conducted in accordance with the rules in Appendix I to Section XI of the Code. The UT examination requirements are contained in Article I-2000 of Appendix I.

Enclosure

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2.2 Request for Approval of an Alternative

It is stated in 10 CFR 50.55a(a)(3) that proposed alternatives to the requirements of paragraphs (c), (d), (e), (f), (g), and (h) of this section, or portions thereof, may be used when authorized by the U.S. Nuclear Regulatory Commission (NRC). The applicant shall demonstrate that: (i) the proposed alternatives would provide an acceptable level of quality and safety, or (ii) compliance with the specified requirements of this section would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

2.3 Basis for Alternative

In the letter dated February 18, 1999, St. Lucie explained the basis for their request as follows. St. Lucie performs inservice examinations of selected welds in accordance with the requirements of 10 CFR 50.55a, plant technical specifications, and the 1989 Edition of the Code. This edition of the Code invokes the examination requirements of Appendix I, Article I-2000 that essentially prescribes a 20-year-old examination methodology. This examination methodology is typically qualified by calibration on side-drilled holes that are drilled in a calibration block fabricated from similar material.

Later editions of the Code and CC N-622 describe a performance demonstration-based examination methodology that is proven to be superior to the current requirements. These demonstrations have been conducted using full-sized vessel specimens that contain fatigue cracks replicating the actual conditions that could be encountered.

The licensee believes that the use of CC N-622 will provide added assurance that the RV welds are free of service-related flaws, thus enhancing quality and ensuring plant safety and reliability. This will be particularly evident in the important under-clad region where the performance demonstrations have resulted in examination technique enhancements that transcend Code requirements. Furthermore, examinations performed with the newer UT techniques that were qualified according to CC N-622 will allow St. Lucie to achieve greater coverage of the Code-required volume, thereby eliminating or substantially reducing areas of reduced coverage such as the coverage described in previously-approved Relief Request No.1. The implementation of CC N-622 is also expected to reduce on-vessel examination time which will reduce radiation exposure to personnel.

3.0 EVALUATION

3.1 Proposed Alternative Examination

The licensee proposed the use of CC N-622, Chapters A.2, A.3 and B-1000 through B-5000 inclusive and Supplements 1, 4, 5A, 6, 7, and 13 in lieu of the requirements of Article I-2000 of Appendix I to the 1989 Edition of Section XI of the Code for the performance of the required volumetric examinations of Class 1 component welds as specified in Table IWB-2500-1, Categories B-A and B-D of the Code. The proposal is for the second inspection interval.

3.1.1 Conducting Alternative Examination

The licensee proposed performing the examinations in accordance with CC N-622 and implemented by the Performance Demonstration Initiative (PDI). The examinations will be performed using mechanized ultrasonic examinations to the maximum extent, in order to achieve essentially 100-percent of the Code-required volume of all welds. Also, the licensee will perform periodic system pressure tests in accordance with Table IWB-2500-1, Category B-P.

3.2 Discussion

The most recent Code referenced in 10 CFR 50.55a is the 1989 Edition with no addenda. The 1989 and earlier editions of the Code contain detailed methodology for UT examinations. The methodology is prescriptive with calibrations being performed on notches or side-drilled holes and flaw sizing being performed with search unit movement and amplitude drop methods. This prescriptive methodology has some shortcomings in detecting and sizing flaws as evident in the discussions in NUREG-0313 and NUREG-0619. In response to the shortcomings, a subgroup to Section XI of the Code undertook the development of UT performance demonstration rules for publication. From the efforts of this subgroup, the ASME published Appendix VIII, "Performance Demonstration for Ultrasonic Examination Systems," to the 1989 Edition with 1989 Addenda of Section XI of the Code.

Appendix VIII provides methodologies for the qualification of procedures, equipment, and personnel using performance-based testing criteria. The testing criteria are rigorous, item-specific performance demonstrations on mockups containing flaws of various sizes and locations. The results from each performance demonstration are analyzed using statistically-based screening criteria that establishes the qualifications for procedure, equipment, and personnel. These qualifications attest to the capabilities of procedures, equipment, and personnel to find flaws that can be detrimental to the integrity of piping and reactor pressure vessels. The qualifications acquired through performance-based testing criteria are more rigorous and reliable than the qualification requirements in the 1989 and earlier editions of the Code for procedures and personnel.

Although Appendix VIII is not a requirement, the United States nuclear utility industry created the PDI to administer the implementation of Appendix VIII. The NRC staff conducted an assessment of the PDI program in January and February 1995. In a letter dated August 5, 1997, the staff completed its assessment of the PDI program. One of the staff's observations from the assessment was that the PDI program differed from certain performance demonstration criteria in Appendix VIII. These differences were primarily related to the difficulty of implementing certain test requirements stipulated in Appendix VIII. These differences were reconciled by ASME in CC N-622. CC N-622 was passed December 11, 1998, by the ASME main committee but has not yet been endorsed by the NRC in Regulatory Guide 1.147.

The staff's review of CC N-622 chapters and supplements within the scope of the February 18 and May 24, 1999, letters, coincides with NRC's views presented at the Code meetings on CC N-622. The staff finds the licensee's proposal acceptable with the following conditions.

- (1) CC N-622, B-3130 (a) reference to [B-2100(d)] is a typographical error and should be [B-2100(e)].
- (2) The staff finds that CC N-622, Supplement 5A, 3.0(b), is unclear. The staff finds this section acceptable provided the personnel and procedures are qualified by performance demonstration, not just the procedures as inferred by 3.0(b).
- (3) CC N-622, B-2200 for RVs is consistent with the staff's views; however, the staff maintains that the qualifications for personnel performing intergranular stress-corrosion cracking examinations are governed by the agreement among the Electric Power Research Institute, the Boiling Water Reactor Owners Group (BWROG), and the NRC, as stated, in part, in NRC's letter to K.P. Donovan, BWROG, dated March 1, 1996, and CC N-622 in no way supersedes this agreement with respect to requalification frequency. Therefore, the requalification frequency for personnel performing intergranular stress-corrosion cracking examinations shall be as stated in the above agreement.
- (4) When selected, CC N-622 shall be used in its entirety for the Code items covered by the licensee's proposed alternative.

Based on the staff's participation in the development of CC N-622 and the above discussion, the staff has determined that the proposed alternative to use CC N-622 Chapters A.2., A.3., B-1000 through B-5000 inclusive and Supplements 1, 4, 5A, 6, 7, and 13 with the above conditions for RV and reactor vessel-to-nozzle UT examinations will provide an equivalent or better examination than the Code requirements.

4.0 CONCLUSION

The staff has reviewed and evaluated the licensee's proposed alternative to use CC N-622 Chapters A.2., A.3., B-1000 through B-5000 inclusive and Supplements 1, 4, 5A, 6, 7, and 13 to perform IWB-2500-1, Examination Category B-A and B-D examinations at St. Lucie Plant, Unit 2 during the second 10-year inspection interval. Based on the above discussion, the staff determined that the proposed alternative with the conditions stated above will provide an equivalent or better examination than the requirements in the 1989 Edition of the Code.

Pursuant to 10 CFR 50.55a(a)(3)(i), the proposed alternative with the conditions stated above is authorized for the RV and reactor vessel-to-nozzle examinations identified above during the second 10-year interval of the St. Lucie Plant, Unit 2 because it provides an acceptable level of quality and safety.

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Date: September 23, 1999



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