



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-524

CAROLINA POWER & LIGHT COMPANY

BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2

DOCKET NOS. 50-325 AND 50-324

1. INTRODUCTION

The Technical Specifications for Brunswick Steam Electric Plant (BSEP), Units 1 and 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 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). 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, 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 ten-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 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 BSEP, Units 1 and 2, second 10-year inservice inspection (ISI) interval is the 1980 Edition, through Winter 1981 Addenda. 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 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 October 19, 1995, Carolina Power and Light Company (licensee) requested approval for the implementation of the alternative rules of ASME Section XI Code Case N-524 dated August 9, 1993, entitled "Alternative Examination Requirements for Longitudinal Welds in Class 1 and 2 Piping - Section XI, Division 1," pursuant to 10CFR 50.55a(a)(3) to be applied to the Inservice Inspection (ISI) program for Brunswick Steam Electric Plant, Units 1 and 2.

The Office of Nuclear Reactor Regulation staff has reviewed and evaluated the licensee's request and supporting information to use Code Case N-524 as a proposed alternative to the Code requirements for BSEP, Units 1 and 2.

## 2.0 EVALUATION:

### CODE CASE N-524 ALTERNATIVE EXAMINATION REQUIREMENTS FOR LONGITUDINAL WELDS IN CLASS 1 AND 2 PIPING - SECTION XI, DIVISION 1

#### Component Identification

Longitudinal Welds in Class 1 and 2 Piping

#### ASME Code Section XI Second Interval Requirements

The 1980 Edition through Winter 1981 Addenda Table IWB-2500-1, Category B-J, Table IWC-2500-1, Category C-F requires surface and volumetric examination of the longitudinal welds.

#### Licensee's Basis for Request

Code Case N-524 allows alternative requirements for surface and volumetric examination of longitudinal piping welds specified in Table IWB-2500-1 (Category B-J) and IWC-2500-1 (Category C-F) of ASME Section XI. The alternative requirements of this Code Case limit the surface and volumetric examination requirements of longitudinal welds to the area or volume contained within the examination requirements of the intersecting circumferential weld. The alternative requirements of this Code Case have been reviewed by CP&L [Carolina Power & Light Company] and determined that the use of this Code Case would provide an acceptable level of quality and safety for the following reasons:

Longitudinal welds are not produced in the field or fabrication shops as is the case of a circumferential weld. Longitudinal piping welds for Class 1 and 2 applications were made by the piping manufacturer under controlled conditions which produced higher quality welds and more uniform residual stress patterns. These welds were examined in accordance with the appropriate ASTM or ASME specifications with additional nondestructive examination requirements imposed by the purchasing specifications. The

manufacturing controls specified by the appropriate ASTM or ASME specifications along with the additional examinations imposed by the purchasing specification provides assurance of the structural integrity of the longitudinal weld at the time the piping is manufactured.

In-service inspections have provided assurance of the structural integrity of the longitudinal welds during the service life of the plant to date. Based on results of these in-service inspections, the Brunswick Plant has not experienced degradation that would warrant continued examination beyond the intersection area or volume bounded by this Code Case. If any degradation associated with a longitudinal weld were to occur, it is expected that it would be located at the intersection with a circumferential weld. The inspection of this intersection is within the scope of this Code Case.

Based on the above, the continual examination of longitudinal welds as currently required by the 1980 Edition with Addenda through Winter 1981 of ASME Code, Section XI, is not technically warranted. The ASME Code committee has recognized this fact and for this reason approved alternative requirements outlined in Code Case N-524.

In addition to the above, there is a significant accumulation of personnel radiation exposure associated with the examination of longitudinal welds. The personal radiation exposure associated with the examination of longitudinal welds are [sic] dependent on the time it would take to remove and reinstall insulation and interferences, prepare the weld for examination, and perform the examinations. Based on the current examination scope for the upcoming Unit 2 Reload 11 (B212R1) outage, exposure savings of approximately 2.5 person-rem (for the main steam system and reactor recirculation system) could result from the approval to use the alternative requirements of Code Case N-524. Therefore, the continued imposition of the ASME code, Section XI examination requirements for longitudinal welds constitutes a hardship to the Brunswick Plant without a compensating increase in quality and safety.

#### Proposed Alternative Examination

The licensee proposes to apply Code Case N-524 as alternative rules for the examination of longitudinal welds in Class 1 and 2 piping.

#### Evaluation/Conclusions

The ASME Section XI Code (1989 Edition) requires one pipe diameter in length, but no more than 12 inches, be examined for Class 1 longitudinal piping welds. Class 2 longitudinal piping welds are required to be examined for a length of  $2.5t$ , where  $t$  is the thickness of the weld. These lengths of weld are measured from the intersection of the circumferential weld and longitudinal weld. The licensee's proposed alternative, Code Case N-524, limits the volumetric and surface examination requirements of the longitudinal weld to the volume or area contained within the examination requirements of the

intersecting circumferential weld.

Longitudinal welds are produced during the manufacturing process of the piping, not in the field as is the case for circumferential welds. The Code contains requirements on characteristics and performance of materials and products, and specifies the examination requirements during the manufacturing of the subject longitudinal piping welds. There are material, chemical, and tensile strength requirements in the Code. The manufacturing process that is specified by the Code provides assurance of the structural integrity of the longitudinal welds at the time the piping is manufactured.

The preservice examination and initial inservice examinations have provided assurance of the structural integrity of the longitudinal welds during the service life of the plant to date. The experience in the United States has been that ASME Code longitudinal welds have not experienced degradation that would warrant continued examination beyond the boundaries required to meet the circumferential weld examination requirements. No significant loading conditions or known material degradation mechanisms have become evident to date which specifically relate to longitudinal seam welds in nuclear plant piping.

If any degradation associated with a longitudinal weld were to occur, it is expected that it would be located at the intersection with a circumferential weld. This intersection is inspected in accordance with the provisions of Code Case N-524. However, a possible error in use of this Code Case could occur if it were applied to ferritic welds where there is not normally a Code-required scan for reflectors located transverse to the circumferential welds. For ferritic welds, the use of this Code Case is contingent on the volumetric examinations of the adjacent circumferential welds at this intersection providing scanning for reflectors transverse to the circumferential welds.

In addition, there is a significant accumulation of man-rem associated with the examination of longitudinal welds, especially in Class 1 piping.

The staff concludes that the licensee's proposed use of Code Case N-524 as an alternative to the Code requirements provides an acceptable level of quality. Therefore, the licensee's proposed alternative to use Code Case N-524 is authorized for Brunswick Steam Electric Plants, Units 1 and 2, pursuant to 10CFR50.55a(a)(3)(i) provided that, at the points of intersection of longitudinal and adjacent circumferential welds, the volumetric examinations of the adjacent circumferential welds provide scanning for reflectors transverse to the circumferential welds.

The licensee is authorized to use Code Case N-524 until such time as the Code Case is included in a future revision of Regulatory Guide 1.147. At that time the licensee is to follow all provisions in Code Case N-524, with limitations issued in Regulatory Guide 1.147, if any, if the licensee continues to implement this relief request.

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