

January 3, 2001

Mr. J. S. Keenan, Vice President
Brunswick Steam Electric Plant
Carolina Power & Light Company
Post Office Box 10429
Southport, North Carolina 28461

SUBJECT: REQUEST FOR APPROVAL OF REVISED RELIEF REQUEST RR-17,
REVISION 4, ON SYSTEM PRESSURE TEST FOR THE THIRD 10-YEAR
INSERVICE INSPECTION INTERVAL -- BRUNSWICK STEAM ELECTRIC
PLANT, UNITS 1 AND 2 (TAC NOS. MA9785 and MA9786)

Dear Mr. Keenan:

By letter dated August 7, 2000, Carolina Power & Light Company submitted Revision 4 to Relief Request RR-17 "Leakage at Bolted Connections," regarding implementation of American Society of Mechanical Engineers (ASME) Section XI Code Case N-566-1 "Corrective Action for Leakage Identified at Bolted Connections" as related to the system pressure testing program of Brunswick Steam Electric Plant, Units 1 and 2, for the third 10-year inservice inspection interval.

As documented in the enclosed Safety Evaluation (SE), the NRC staff has evaluated the information provided in support of the use of ASME Code Case N-566-1, and pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(a)(3)(i), finds the request to be acceptable.

The NRC staff finds that authorization of your alternative examination would provide assurance of structural integrity and, therefore, an acceptable level of quality and safety. Accordingly, pursuant to 10 CFR 50.55a(a)(3)(i), your proposed alternative examination is authorized. The staff's SE is enclosed.

Please contact Donnie Ashley at (301) 415-3191 if you have any questions regarding this matter.

Sincerely,

/RA/

Richard P. Correia, Chief, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-325 and 50-324

Enclosure: Safety Evaluation

cc w/encl: See next page

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*No substantive change to SE

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
OF THE THIRD 10-YEAR INSERVICE INSPECTION INTERVAL PROGRAM
REQUEST FOR RELIEF FROM THE REQUIREMENTS OF
ASME SECTION XI, SYSTEM PRESSURE TEST REQUIREMENTS
CAROLINA POWER & LIGHT COMPANY
BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2
DOCKET NOS. 50-324 AND 50-325

1.0 INTRODUCTION

The inservice inspection (ISI) 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 (Code) and applicable addenda as required by Title 10 of the *Code of Federal Regulations* (10 CFR) Section 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 difficulty 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 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) 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The applicable ISI Code of Record for the third 10-year ISI interval of Brunswick Steam Electric Plant, Units 1 and 2, is the 1989 Edition of ASME Section XI.

By letter dated August 7, 2000, Carolina Power & Light Company (CP&L, the licensee) submitted Revision 4 to Relief Request RR-17 "Leakage at Bolted Connections," regarding implementation of ASME Section XI Code Case N-566-1 "Corrective Action for Leakage Identified at Bolted Connections" as related to the system pressure testing program of Brunswick Steam Electric Plant, Units 1 and 2, for the third 10-year ISI interval.

The NRC staff has evaluated the licensee's Relief Request RR-17, Revision 4, pursuant to 10 CFR 50.55a(a)(3)(i) for the third 10-year ISI interval of Brunswick Units 1 and 2. The staff's review is discussed below.

2.0 DISCUSSION - RELIEF REQUEST RR-17, REVISION 4

2.1 Components for which Relief is Requested:

Class 1, 2, and 3 pressure-retaining components subject to system pressure testing.

2.2 Code Requirement:

ASME Section XI, 1989 Edition, paragraph IWA-5250(a)(2), states that if leakage occurs at a bolted connection during a system pressure test, the bolting shall be removed, visually (VT-3) examined for corrosion, and evaluated in accordance with paragraph IWA-3100.

2.3 Licensee's Code Relief Request (as stated):

Relief is requested from the requirements specified in paragraph IWA-5250(a) of the ASME Code, Section XI, 1989 Edition. In accordance with 10 CFR 50.55a(a)(3)(i), Carolina Power and Light (CP&L) Company is requesting approval to use alternative requirements to those specified in paragraph IWA-5250(a)(2). If leakage is discovered at a bolted connection, the leakage will be located and evaluated for corrective measures. Where the evaluation of the variables determines the need for further evaluation, the bolt nearest the source of leakage will be removed and a VT-1 examination performed on the bolt.

2.4 Licensee's Proposed Alternative (as stated):

When leakage is detected at bolted connections, as an alternative to the requirements of IWA-5250(a)(2), the requirements of either 1 or 2 below shall be met:

1. The leakage shall be stopped and the bolting and component material shall be evaluated to determine joint integrity and the susceptibility of the bolting to corrosion and failure. The evaluation will, at a minimum, consider the following factors:
 - a) The number and service age of the bolts
 - b) Bolt and component material
 - c) Corrosiveness of the process fluid that is leaking
 - d) Leakage location and system function
 - e) Leakage history at the connection or other system components
 - f) Visual evidence of corrosion at the connection (i.e., while the connection is assembled)

2. If the leakage is not stopped, the joint shall be evaluated in accordance with IWB- 3142.4 to determine joint integrity and the susceptibility of the bolting to corrosion and failure. The evaluation will, at a minimum, consider the following factors:
 - a) The number and service age of the bolts
 - b) Bolt and component material
 - c) Corrosiveness of the process fluid that is leaking
 - d) Leakage location and system function
 - e) Leakage history at the connection or other system components
 - f) Visual evidence of corrosion at the connection (i.e., while the connection is assembled)

When the evaluation of the above factors is concluded, and if the evaluation determines that the leaking condition has not degraded the fasteners, then no further action is required. However, reasonable attempts shall be made to stop the leakage as appropriate. In accordance with IWB-3144(b), the evaluation analyses will be submitted to the regulatory authority having jurisdiction at the plant site.

If the evaluation of the factors in 1 or 2 above indicates the need for further evaluation, then a bolt closest to the source of leakage shall be removed. The bolt will receive a VT-1 examination and be evaluated and dispositioned in accordance with IWB-3517. If the removed bolting shows evidence of rejectable degradation, all remaining bolts shall be removed and receive a VT-1 examination in accordance with IWB-3140. If leakage is identified when the bolted connection is in service and the information in the evaluation is supportive, the removal of the bolt for the VT-1 examination may be deferred until the next refueling outage.

2.5 Licensee's Basis for Relief Request:

As an alternative to the requirements of IWA-5250(a)(2), CP&L proposes to follow the requirements of ASME Code Case N-566-1, which states that the requirements of (a) or (b) below shall be met.

- (a) The leakage shall be stopped, and the bolting and component material shall be evaluated for joint integrity as described in (c) below.
- (b) If the leakage is not stopped, the joint shall be evaluated in accordance with IWB-3142.4 for joint integrity. This evaluation shall include the considerations listed in (c) below.
- (c) The evaluation of (a) and (b) above is to determine the susceptibility of the bolting to corrosion and failure. This evaluation shall include the following:
 - (1) the number and service age of the bolts;
 - (2) bolt and component material;
 - (3) corrosiveness of process fluid;
 - (4) leakage location and system function;

- (5) leakage history at the connection or other system components;
- (6) visual evidence of corrosion at the assembled connection.

Also, in addition to the requirements of Code Case N-566-1, CP&L proposes an additional action in those cases where the evaluation of the specified factors indicates the need for further evaluation. In such cases, the bolt closest to the source of leakage will be removed. The removed bolt will receive a VT-1 examination and be evaluated and dispositioned in accordance with IWB-3517. If the removed bolt shows evidence of rejectable degradation, all remaining bolts will be removed and receive a VT-1 examination in accordance with IWB-3140. If leakage is identified when the bolted connection is in service and the information in the evaluation is supportive, the removal of the bolt for the VT-1 examination may be deferred until the next refueling outage.

CP&L has determined that implementation of the proposed alternative will provide an acceptable level of quality and safety for the following reasons (as stated):

1. CP&L has determined that implementation of the IWA-5250(a)(2) requirement can have an adverse impact on plant operation and personnel exposure. For example, the disassembly and re-assembly of components for the performance of the visual (VT-3) examination on the bolting has the potential to delay the return of a safety related system to service, delay of plant startup following the completion of the Class 1 leakage test, and the potential for significant additional radiation dose.
2. A significant portion of the pressure retaining bolting is made of stainless steel materials. Since the normal Class 1 pressure boundary of a boiling water reactor contains only demineralized water, the likelihood of severe corrosion is minimal. While stainless steel bolting is more susceptible to stress corrosion cracking under certain conditions, the detection of this type of corrosion on bolting material is difficult with the visual (VT-3) examination technique.
3. During each refueling outage, a Class 1 ASME Section XI leakage test is performed. A majority of the bolted connection leakage found during these leakage tests is associated with the Control Rod Drive (CRD) housing connections. This is a common industry occurrence and, in most cases, the leakage stops within 8 hours of being pressurized to greater than 1000 psig. Should leakage be detected at these CRDs, the requirements of IWA-5250(a)(2) would mandate removal of the bolting and performance of a VT-3 examination on the bolting. Removal of the bolting for the sole purpose of performing a visual (VT-3) examination would result in personnel exposure without a compensating increase in quality and safety.
4. The majority of the Class 2 systems transport a non-corrosive medium such as demineralized water, nitrogen, or air. Since the medium is non-corrosive, the bolted connections associated with these systems would not be susceptible to severe corrosion. Thus, the disassembly and re-assembly of a bolted connection for the performance of the visual (VT-3) examination of the bolting has the potential to delay the return of a safety related system to service.

Based on the above, the proposed alternative will ensure that the structural integrity of the affected joint is maintained, while reducing operational, maintenance, and radiological hardships resulting from the current ASME Code requirement.

3.0 EVALUATION

In accordance with the 1989 Edition of the ASME Code, Section XI, when leakage occurs at a bolted connection during a system pressure test, the bolting shall be removed, VT-3 examined, and evaluated for corrosion in accordance with IWA-3100. In lieu of the Code-required removal of bolting to perform a VT-3 visual examination, the licensee has proposed to use Code Case N-566-1, which requires that the leakage be stopped and the joint integrity be reviewed. If the leakage is not stopped, the joint shall be evaluated in accordance with IWB-3142.4 for joint integrity, which relies on an analytical evaluation of a component, considering the relevant conditions for continued service. The evaluation for the specific case would consider number and service age of the bolts, bolt and component material, corrosiveness of process fluid, leakage location and system function, leakage history at the connection or other components, and visual evidence of corrosion at the assembled connection. This alternative allows the licensee to utilize a systematic approach and sound engineering judgment, provided that as a minimum, all of the evaluation factors listed in the Code case are considered. If the joint is acceptable for continued service based on an analytical evaluation, it shall be subsequently examined in accordance with IWB-2420(b) and (c). Furthermore, if the licensee's evaluation requires removal of a bolt, the visual evidence of corrosion will be performed by a VT-1 visual examination as stated in the request for relief. The Code case also requires that the evaluation of joint integrity, performed in accordance with IWB-3142.4, be applied to all ASME Code piping irrespective of the piping class. This application is more stringent than that required by the applicable Code. Therefore, the use of Code Case N-566-1 in lieu of the requirements of IWA-5250(a)(2) in regard to corrective action for leakage identified at bolted connections will provide an acceptable level of quality and safety since the integrity of the joint will be maintained.

4.0 CONCLUSION

The staff concludes that the licensee's proposed alternative to use Code Case N-566-1, as supplemented, provides an acceptable level of quality and safety and is, therefore, authorized pursuant to 10 CFR 50.55a(a)(3)(i) for Brunswick Steam Electric Plant, Units 1 and 2, for the third 10-year ISI interval or until such time as Code Case N-566-1 is published in Regulatory Guide 1.147. At that time, if the licensee intends to continue to implement Code Case N-566-1, the licensee should follow all conditions, if any, as specified in the Regulatory Guide.

Principal Contributor: K. Wichman

Date: January 3, 2001

Mr. J. S. Keenan
Carolina Power and Light Company

Brunswick Steam Electric Plant
Units 1 and 2

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PD II-2 DOCUMENT COVER PAGE

DOCUMENT NAME: C:\Brunswick MA 9785_6_RRrespo~.wpd
SUBJECT: REQUEST FOR APPROVAL OF REVISED RELIEF REQUEST
RR-17, REVISION 4 ON SYSTEM PRESSURE TEST
ORIGINATOR: D.Ashley
SECRETARY: M. Wohl
DATE: December 15, 2000

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