Progress Energy

NOV 0 4 2004

10 CFR 50.55a(a)(3)(ii)

SERIAL: BSEP 04-0146

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Subject: Brunswick Steam Electric Plant, Unit Nos. 1 and 2
Docket Nos. 50-325 and 50-324/License Nos. DPR-71 and DPR-62
Relief Request RR-34, Control Rod Drive System Hydraulic Lines

Ladies and Gentlemen:

In accordance with 10 CFR 50.55a(a)(3)(ii), Carolina Power & Light Company, now doing business as Progress Energy Carolinas, Inc. (PEC), hereby requests NRC approval of a relief request for the third 10-year interval Inservice Inspection Program for the Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2. The request for relief pertains to structural integrity of insert, withdrawal, and charging water piping for the Control Rod Drive (CRD) System. The details of the 10 CFR 50.55a request are provided in Enclosure 1. A list of regulatory commitments is provided in Enclosure 2.

Due to the operational impacts associated with inserting control rods when ASME Code structural integrity requirements are in question, PEC requests expeditious approval of this request. Currently, examination of the affected CRD piping is scheduled to begin the week of November 29, 2004; therefore, approval of this relief is requested by November 29, 2004.

Please refer any questions regarding this submittal to Mr. Leonard R. Beller, Supervisor - Licensing/Regulatory Programs, at (910) 457-2073.

Sincerely,

Edward T. O'Neil
Manager - Support Services
Brunswick Steam Electric Plant

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WRM/wrm

Enclosures:
1. 10 CFR 50.55a Request Number RR-34
2. List of Regulatory Commitments

cc (with enclosures):

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10 CFR 50.55a Request Number RR-34

Proposed Alternative In Accordance with 10 CFR 50.55a(a)(3)(ii)

- Hardship or Unusual Difficulty
without Compensating Increase in Level of Quality and Safety -

1. ASME Code Components Affected

Code Class:	Class 2
Examination Categories:	C-H
Item numbers:	Not Applicable
Affected Components:	1-C11-1/2-905 (Charging Water, 137 drives) 2-C12-1/2-905 (Charging Water, 137 drives) 1-C11-3/4-905 (CRD Drive Water Withdrawn, 137 drives) 2-C12-3/4-905 (CRD Drive Water Withdrawn, 137 drives) 1-C11-1-905 (CRD Drive Water Withdrawn, 137 drives) 2-C12-1-905 (CRD Drive Water Withdrawn, 137 drives) 1-C11-1-905 (CRD Drive Water Insert, 137 drives) 2-C12-1-905 (CRD Drive Water Insert, 137 drives)

The affected control rod drive (CRD) piping is classified as an ASME Code, Class 2 component, and is comprised of small diameter (i.e., less than or equal to 1 inch nominal pipe size), SA-376 Type 304 stainless steel pipe.

The normal service pressure of the CRD insert and withdraw lines is approximately 1030 psig (i.e., normal reactor operating pressure). The service pressure in these lines increases approximately 260 to 275 psi when a drive signal is given. The normal service temperature of the CRD insert and withdraw lines is approximately 120°F.

The normal service pressure of the CRD charging water lines is approximately 1400-1500 psig (i.e., the normal charging water pump pressure). The normal service temperature of the CRD charging water lines is approximately 120°F.

2. Applicable Code Edition and Addenda

The Code of Record for the third 10-year inservice inspection interval at the Brunswick Steam Electric Plant (BSEP), Unit 1 and 2 is the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, 1989 Edition, with no addenda.

The third 10-year inservice inspection interval began May 11, 1998, and will conclude on May 10, 2008.

3. Applicable Code Requirement

Subarticle IWA-4300, Defect Removal, requires that a defect be removed or reduced to an acceptable size in accordance with Article IWA-4000.

4. Reason for Request

Background

On July 24, 2004, Carolina Power & Light Company, now doing business as Progress Energy Carolinas, Inc. (PEC), discovered through-wall leaks on three Unit 2 CRD insert lines. The cause of these leaks is believed to be chloride-induced transgranular stress corrosion cracking, with the chloride contamination source being overhead salt water drain lines that were found to be degraded and leaking. The subsequent extent-of-condition inspections found other Unit 1 and Unit 2 CRD piping that were affected by the salt water drain line leakage. Based on examination and evaluation of the affected piping, repair of four insert lines was required. The repairs were accomplished by installing an ASME Code-compliant mechanical clamp device, in accordance with Code Case N-523-2, to further ensure structural integrity and to control leakage. This information was discussed in NRC Integrated Inspection Report Nos. 50-325/2004-04 and 50-324/2004-04.

Although the most susceptible piping has already been examined, as a proactive measure, PEC has developed an action plan to assess other piping that may be susceptible to this condition. Based on the results of this action plan, additional piping within the CRD System is being examined. For this reason, PEC is requesting relief from ASME Section XI Code requirements that require removal or reduction of any defects that are identified. Without defect removal or reduction, as stipulated by ASME Code requirements, the Code would require the affected CRD piping to be removed from service.

Discussion

As described above, surface corrosion has been identified on some Unit 1 and Unit 2 CRD piping. Following the cleaning and a liquid penetrant examination of suspect areas, defects may be identified. Since the affected components will be in service and cannot be isolated with the unit in operation, examinations involving removal of piping wall material in excess of 12-1/2 percent of the piping wall thickness results in a personnel safety hardship; therefore, PEC proposes, for personnel safety reasons, not to remove the defects or reduce them to an acceptable size as required by IWA-4300. Ultrasonic testing (UT) cannot be used to characterize defect depth on these lines due to their small diameter (i.e., less than or equal to 1 inch nominal pipe size). Without complete characterization of a defect, the ASME Section XI Code requires that PEC presume the defects exceed the applicable acceptance standards for the piping, and thus the requirements of the ASME Code with respect to acceptance by evaluation cannot be satisfied. Accordingly, the affected piping must be declared inoperable. Since the affected piping supports operability of an associated control rod, the associated control rod must be declared inoperable,

inserted, and disarmed to accomplish its safety function. Hardship also results from the operational impacts associated with insertion of an affected control rod.

The proposed alternative to the requirements of IWA-4300 involves use of an engineering evaluation to demonstrate the structural integrity of the affected CRD piping. The engineering evaluation will conservatively assume for any defects identified that the defect depth is equal to nominal pipe wall thickness.

Although the evaluation will demonstrate that structural integrity of the affected CRD piping is being maintained, periodic liquid penetrant examinations will be performed to monitor defect growth. If actual leakage should be observed from the affected CRD piping, either during initial examination or during subsequent monitoring, or if during subsequent monitoring defect growth exceeds the length established in the evaluation, the control rod associated with the affected CRD pipe will be declared inoperable, inserted into the reactor core, and disarmed, until an ASME Code repair/replacement activity can be completed. Once a Code repair/replacement activity has been completed, the affected control rod will be returned to service.

The specific condition being addressed under this hardship involves portions of CRD piping which may exhibit transgranular stress corrosion cracking (TGSCC) due to exposure to salt water from degraded plant floor drain system piping. Based on the presence of the salt water (i.e., chlorides) and previous surface examination results (i.e., linear indications in the suspect areas), and comparison of this condition to a similar condition investigated for CRD piping inside containment, as documented for BSEP Licensee Event Report 2-88-007, PEC believes this condition is chloride-induced TGSCC. Confirmation that TGSCC is the cracking mechanism involved cannot be completed until removal and replacement of the affected CRD piping during each unit's refueling outage (i.e., Spring 2005 for Unit 2, and Spring 2006 for Unit 1).

Corrective actions have been made to the overhead salt water drain line piping to preclude further chloride contamination and corrosion of the affected CRD piping. As part of PEC's action plan, suspect CRD piping will be cleaned and examined. The examination of the suspect areas will involve a surface examination (i.e., liquid penetrant method) performed in accordance with an approved BSEP non-destructive examination procedure.

Because the indications are primarily located on the piping material, and because of the nominal pipe size of the affected CRD piping (i.e., less than or equal to 1 inch nominal pipe size), there are no surface examination acceptance standards for this Class 2 piping in the 1989 Edition of the Section XI Code. Therefore, the requirements of the ASME Code, Section XI, Subparagraph IWA-3100(b) will be followed. Subparagraph IWA-3100(b) would require that flaws on the identified CRD piping be evaluated using the acceptance standards for materials and welds specified in the ASME Code Section III Edition applicable to the construction of the component. Since BSEP is not an ASME Section III plant, the applicable requirement of United States of America Standard (USAS) B31.1.0 (i.e., the construction code of record) and material specification SA-376 will be followed.

Under Specification SA-376, surface imperfections that penetrate greater than 12-1/2 percent of the nominal wall thickness, or that encroach on the minimum wall thickness, are considered defects.

Once classified as a defect, the applicable requirements of IWA-4300 for defect removal are required to be met. The requirements of IWA-4300 would require removing the defect or reducing the defect to an acceptable size. The affected component would be considered acceptable for continued service until the removal cavity is less than the minimum design wall thickness.

Since the plant will be in operation during these examinations, for personnel safety reasons, PEC proposes to keep piping material removal to a minimum. For this reason, PEC proposes to stop material removal at 12-1/2 percent of nominal wall thickness and conservatively consider any relevant flaws as defects. Since the defect will not be removed or reduced to an acceptable size and depth cannot be characterized, the ASME Section XI Code would require the removal of the affected component from service until a repair/replacement activity can be performed. In addition, since minimum design wall thickness cannot be assured, the condition would call into question the integrity of the affected piping. Accordingly, the affected piping must be declared inoperable. Since the affected piping supports operability of an associated control rod, the associated control rod must be declared inoperable, inserted, and disarmed to accomplish its safety function.

In lieu of these actions, PEC proposes to disposition any CRD piping defects through an engineering evaluation that demonstrates the structural integrity of the affected piping. The engineering evaluation will conservatively assume for any defects identified that the defect depth is equal to nominal pipe wall thickness. PEC plans to complete these engineering evaluations within 48 hours following identification of a defect. Following completion, the engineering evaluation will be submitted to the NRC for review.

In the unlikely event that a degraded CRD pipe should begin leaking, or defect growth should be observed beyond that considered in the engineering evaluation, the control rod associated with the affected CRD line will be declared inoperable. The control rod will be inserted and disarmed. These actions are consistent with the guidance of NRC Generic Letter 91-18, Revision 1, "Information to Licensees Regarding NRC Inspection Manual Section on Resolution of Degraded and Nonconforming Conditions" and draft Regulatory Issue Summary 2004-xx, "Revision to Guidance Formerly Contained in NRC Generic Letter 91-18, 'Information to Licensees Regarding Two NRC Inspection Manual Sections on Resolution of Degraded and Nonconforming Conditions and on Operability'," both of which state that upon discovery of leakage from a Class 1 or 2 component pressure boundary, the component should be declared inoperable.

For degraded CRD piping that is leaking, as expeditiously as possible, but no later 30 days after leak identification, an ASME Code-compliant mechanical clamping device will be fabricated and installed as a repair, to control leakage, and to further ensure structural integrity in accordance with Code Case N-523-2. Code Case N-523-2 has been found acceptable by the NRC for

implementation, as documented in NRC Regulatory Guide 1.147, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," Revision 13, January 2004. The monitoring requirements of Code Case N-523-2 will be performed until the ASME repair/replacement activity can be performed for the affected piping. These monitoring requirements include volumetric monitoring, at least every three months, of the area immediately adjacent to the clamping device and monitoring at least weekly for leakage. In instances where a mechanical clamping device is installed, as stipulated by Code Case N-523-2, no later than the next refueling outage, an ASME Code-compliant repair/replacement activity for the affected portion of the CRD system piping will be performed.

Operational Impacts

As previously stated, PEC is requesting relief from ASME Section XI Code requirements that require removal or reduction of any defects that may be identified. Without removal or reduction of such defects, as stipulated by ASME Code requirements, the Code would require the affected piping to be declared inoperable. As a result, the associated control rod would be required to be inserted since the integrity of the CRD piping, which is a support system that is required to accomplish the safety function provided by control rod, would be in question.

While plant operation may continue with one or more control rods inserted and disarmed, this poses significant operational challenges and reactivity management concerns. If required to insert control rods, a significant power reduction is required. As a result, control rod patterns have to be adjusted and return to maximum power is not certain. An abnormal control rod pattern is considered a precursor to a reactivity management event, from a human performance perspective, and also challenges thermal limits due to flux shift to other parts of the reactor core. In addition, inserted control rods will experience reduced rod lifetime, possibly requiring early replacement and disposal at significant cost in personnel radiological exposure and financial costs.

Code Repair

The appropriate Code repair/replacement activity for a defect in the affected portion of the CRD piping would require cutting and replacement. There is no isolation device, other than a check valve in CRD insert lines, between the degraded piping and the CRD mechanism inside primary containment. As such, a repair/replacement activity for the affected CRD piping is impractical unless the unit is shut down.

5. Proposed Alternative and Basis For Use

Proposed Alternative

In lieu of the ASME Section XI Code, Subarticle IWA-4300 requirement to remove the defect or reduce it to an acceptable limit, PEC proposes, as an acceptable alternative, to disposition any identified CRD piping defects through an engineering evaluation that demonstrates the affected piping will maintain structural integrity. The engineering evaluation will conservatively assume,

for any defects identified, that the defect depth is equal to nominal pipe wall thickness. Following the guidance of the ASME Section XI Code, as stipulated by Subarticle IWC-3125 of the ASME Section XI Code, the engineering evaluation will be submitted to the NRC for review. To ensure the NRC remains promptly informed of examination results for the subject CRD piping that require the use of an engineering evaluation, PEC plans to submit these engineering evaluations to the NRC in a timely manner, but no later than 90 days following completion.

An initial follow-up liquid penetrant examination of the defects will be performed within 30 days to ensure no significant crack growth (i.e., a growth rate in excess of that assumed in the engineering evaluation) is occurring, after which subsequent follow-up liquid penetrant examinations will be performed at least every 90 days. In addition, daily examinations of the affected piping for evidence of leakage will be performed.

In any instances where a CRD piping defect is identified, regardless of whether a mechanical clamping device is installed or an engineering evaluation is performed, no later than the next refueling outage, an ASME Code-compliant repair/replacement activity for the affected portion of the CRD system piping will be performed.

Engineering Evaluation Methodology

An engineering evaluation will be performed using the methods of the 1989 Edition of the ASME Code, Section XI, Appendix C, "Evaluation of Flaws in Piping," and the non-destructive examination (NDE) data collected for the piping defects. The evaluation will be performed to confirm that axial and circumferential defect sizes do not exceed Code acceptance criteria, including applicable factors of safety. Consideration for potential defect growth during the period from the date of identification to the expected date of repair/replacement (i.e., the evaluation period) will be factored into the evaluation and acceptance criteria.

The acceptance criteria for evaluation methods provided by Appendix C are bounded by defect depths that are limited to 75 percent of nominal pipe wall thickness. Appendix C establishes this limit to ensure surface defects will remain below critical size if they should grow through-wall. As previously stated, due to NDE limitations associated with small bore piping, the actual defect depth cannot be determined. Therefore, for evaluation purposes, PEC will conservatively assume that the defect depth is equal to nominal pipe wall thickness.

To account for the actual defect depth uncertainty, the degraded piping will be monitored on a daily basis during Operator rounds to identify any leakage which may develop until the repair/replacement activity is implemented. If, at any point, leakage is identified, the appropriate actions will be followed. In addition, the degraded piping will be initially re-examined within 30 days of the discovery of a defect using the liquid penetrant method, after which subsequent follow-up liquid penetrant examinations will be performed at least every 90 days, to monitor for defect growth.

The engineering evaluation will assume a potential defect (i.e., crack) growth rate of 0.036 in/month (5.0×10^{-5} in/hr) for each crack tip. Very little industry data is available for the

growth of stress corrosion cracking for Type 304 stainless steel in a low temperature air environment, which is similar to the environmental temperature for the Brunswick CRD System piping. The value above is based on intergranular stress corrosion cracking (IGSCC) crack growth experience (e.g., Reference 6), and is a value that is supported by extensive laboratory test data that has been reviewed and approved by the NRC. The industry data that was retrieved for TGSCC crack growth rates is bounded by this IGSCC value.

Based on the above, the engineering evaluation and subsequent monitoring will provide an acceptable level of quality and safety to that of the applicable Code requirement by demonstrating that structural integrity of the affected CRD piping will be maintained, even if the identified defect is assumed to extend through the entire wall thickness of the CRD pipe.

6. Duration of Proposed Alternative

Use of the alternative is proposed for the remainder of the current 10 year inservice inspection interval.

7. Precedents

No precedents have been identified.

8. References

1. NRC Integrated Inspection Report Nos. 50-325/2004-04 and 50-324/2004-04 dated October 15, 2004, ADAMS Accession Number ML042890141.

2. NRC Generic Letter 91-18, Revision 1, "Information to Licensees Regarding NRC Inspection Manual Section on Resolution of Degraded and Nonconforming Conditions," dated October 8, 1997.

3. Draft NRC Regulatory Issue Summary 2004-xx, "Revision to Guidance Formerly Contained in NRC Generic Letter 91-18, 'Information to Licensees Regarding Two NRC Inspection Manual Sections on Resolution of Degraded and Nonconforming Conditions and on Operability'," ADAMS Accession Number ML042080035.

4. ASME Code Case N-523-2, "Mechanical Clamping Devices for Class 2 and 3 Piping, Section XI, Division 1."

5. NRC Regulatory Guide 1.147, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," Revision 13, January 2004.

6. Electric Power Research Institute (EPRI) Report TR-105873, "BWRVIP Evaluation of Crack Growth Rate in BWR Stainless Steel Internals - BWRVIP-14," March 1996.

List of Regulatory Commitments

The following table identifies those actions committed to by Carolina Power & Light (CP&L) Company, now doing business as Progress Energy Carolinas, Inc. (PEC), in this document. Any other actions discussed in the submittal represent intended or planned actions by PEC. They are described for the NRC's information and are not regulatory commitments. Please notify the Manager - Support Services at the Brunswick Steam Electric Plant of any questions regarding this document or any associated regulatory commitments.

	Commitment	Committed date or outage
1.	To ensure the NRC remains promptly informed of examination results for the subject control rod drive (CRD) piping that require the use of an engineering evaluation, PEC will submit the engineering evaluations to the NRC no later than 90 days following completion.	N/A
2.	If a degraded CRD pipe should begin leaking, or defect growth should be observed beyond that considered in the engineering evaluation, as expeditiously as possible, but no later 30 days after leak identification, an ASME Code-compliant mechanical clamping device will be fabricated and installed in accordance with ASME Code Case N-523-2 as a repair, to control leakage, and to further ensure structural integrity.	N/A
3.	In any instances where a CRD piping defect is identified, regardless of whether a mechanical clamping device is installed or an engineering evaluation is performed, no later than the next refueling outage, an ASME Code-compliant repair/replacement activity for the affected portion of the CRD system piping will be performed.	Next refueling outage on each unit