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August 17, 1995

SERIAL: BSEP 95-0381

U. S. Nuclear Regulatory Commission  
ATTENTION: Document Control Desk  
Washington, DC 20555

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2  
DOCKET NOS. 50-325 AND 50-324/LICENSE NOS. DPR-71 AND DPR-62  
RESPONSE TO NRC GENERIC LETTER 92-01, REVISION 1, SUPPLEMENT 1  
REACTOR PRESSURE VESSEL INTEGRITY

Gentlemen:

On May 19, 1995, the NRC issued Supplement 1 to Generic Letter 92-01, Revision 1. This supplement requested licensees to identify, collect, and report any new data pertinent to the analysis of structural integrity and to assess the impact of that data on their Reactor Pressure Vessel's (RPVs) integrity analyses relative to the requirements of 10 CFR 50.60, 10 CFR 50.61 and 10 CFR Part 50 Appendices G and H, as applicable. The purpose of this letter is to provide Carolina Power & Light Company's (CP&L) response to Part 1 of Generic Letter 92-01, Revision 1, Supplement 1, for Brunswick Steam Electric Plant, Units 1 and 2. This detailed response is provided in the attachment to this letter.

Please refer any questions regarding this submittal to Mr. George Honma at (910) 457-2741.

Sincerely,

Roy A. Anderson

GMT/

Enclosure

William R. Campbell, having been first duly sworn, did depose and say that the information contained herein is true and correct to the best of his information, knowledge and belief; and the sources of this information are officers, employees, and agents of Carolina Power & Light Company.

  
Notary (Seal)

My commission expires: August 12, 1996

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cc: Mr. S. D. Ebner, Regional Administrator, Region II  
Mr. D. C. Trimble, NRR Project Manager - Brunswick Units 1 and 2  
Mr. C. A. Patterson, NRC Senior Resident Inspector - Brunswick Units 1 and 2  
The Honorable H. Wells, Chairman - North Carolina Utilities Commission

## ENCLOSURE 1

### BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2 DOCKET NOS. 50-325 AND 50-324/LICENSE NOS. DPR-71 AND DPR-62 RESPONSE TO NRC GENERIC LETTER 92-01, REVISION 1, SUPPLEMENT 1 REACTOR PRESSURE VESSEL INTEGRITY

#### INTRODUCTION:

On March 6, 1992, the Nuclear Regulatory Commission (NRC) issued Generic Letter 92-01, Revision 1, "Reactor Vessel Structural Integrity, 10 CFR 50.54(f)." This generic letter requested licensees provide to the NRC specific information relative to reactor vessel integrity. Carolina Power & Light Company (CP&L) provided a response for the Brunswick Steam Electric Plant (BSEP), Units 1 and 2, in letters dated July 6, 1992, (Serial: NLS 92-180) and July 9, 1993, (Serial: BSEP 93-0110).

By letter dated April 1, 1994, the NRC requested CP&L to verify certain information contained in the Reactor Vessel Integrity Database (RVID) for materials properties used in the determination of Pressure-Temperature Limits and Upper Shelf Energy (USE) parameters. CP&L provided a response in a letter dated May 13, 1994 (Serial: BSEP 94-0179).

On May 19, 1995, the NRC issued Supplement 1 to Generic Letter 92-01, Revision 1. This supplement requested licensees to identify, collect, and report any new data pertinent to the analysis of structural integrity and to assess the impact of that data on their Reactor Pressure Vessel's (RPV's) integrity analyses relative to the requirements of 10 CFR 50.60, 10 CFR 50.61 and 10 CFR Part 50 Appendices G and H, as applicable. The generic letter requested that licensees provide the following information:

- (1) a description of those actions taken or planned to locate all data relevant to the determination of RPV integrity, or an explanation of why the existing data base is considered complete as previously submitted (due 90 days from Generic Letter issuance);
- (2) an assessment of any change in best estimate chemistry based upon consideration of all relevant data (due 6 months from Generic Letter issuance);
- (3) a determination of the need for use of the ratio procedure in accordance with the established Position 2.1 of Regulatory Guide 1.99, Revision 2, for those licensees that use surveillance data to provide a basis for the RPV integrity evaluation (due 6 months from Generic Letter issuance); and
- (4) a written report providing any newly acquired data as specified above and (1) the results of any necessary revisions to the evaluation of RPV integrity in accordance with the requirements of 10 CFR 50.60, 10 CFR 50.61, Appendices G and H to 10 CFR Part 50, and any potential impact on the LTOP or P-T limits in the technical specifications or (2) a certification that previously submitted evaluations remain valid. Revised evaluations and certifications should include consideration of Position 2.1 of Regulatory Guide 1.99, Revision 2, as applicable, and any new data (due 6 months from Generic Letter issuance).

The following information is provided in response to Part 1 of Generic Letter 92-01, Revision 1, Supplement 1:

## **BWR VESSEL & INTERNALS PROJECT COORDINATED RESPONSE:**

The BWR Vessel & Internals Project (BWRVIP) recently furnished the NRC with its plan for addressing those issues identified in Supplement 1 to Generic Letter 92-01, Revision 1 (Reference: BWRVIP letter 95-404 dated August 10, 1995). This BWRVIP plan includes identification of sister plants, comprehensive RPV data retrieval, determination of "best estimate" weld chemistries, consideration of "ratio procedure" application as established in Position 2.1 of Regulatory Guide 1.99 Revision 2, and an assessment of any necessitated changes to pressure-temperature limits (P-T) and/or upper shelf energy (USE) projections based on newly acquired chemistry data. As noted in the coordinated BWRVIP Generic Letter response, completion of these activities will take approximately 24 months. However, the BWRVIP will be providing a preliminary assessment by November 20, 1995, based on available data at the time.

CP&L will be following the future progress of the BWRVIP activities focused on addressing the Generic Letter issues. However, since these BWRVIP activities will not be completed for 24 months, CP&L will also conduct its own assessments (as outlined below) to ensure that a preliminary response to Generic Letter Parts 2, 3, and 4 for the Brunswick Steam Electric Plant (BSEP) can be provided by November 19, 1995.

## **BRUNSWICK PLANT-SPECIFIC RESPONSE:**

### **Weld Chemistry:**

One of the main considerations discussed in Supplement 1 of Generic Letter 92-01, Revision 1, is the subject of chemistry variability of submerged arc (SAW) weld joints used in the fabrication of RPVs. The chemistry variability observed in some SAW welds has been attributed primarily to two past practices by weld wire manufacturers and RPV fabricators for some early vintage RPVs; (1) the addition of a copper coating/"flashing" to the SAW weld wire which has now been determined to contribute to copper variability in the welds, and (2) the inclusion of a cold wire nickel feed (separate from the primary electrode) in some past SAW processes which has been determined to contribute to nickel variability in the welds.

A preliminary review of available data suggests that neither copper coated SAW weld wire nor the cold nickel wire feed were used in the SAW fabrication of the Brunswick Steam Electric Plant RPV weldments. This will be verified as a part of the ongoing effort to respond to Parts 2, 3, and 4 of Generic Letter 92-01, Revision 1, Supplement 1. CP&L is not aware of any significant chemistry variability issues reported for SAW weld joints fabricated using un-coated weld wire and without the separate nickel wire addition. Accordingly, CP&L does not expect that a significant variability in copper or nickel content would exist for any boltline weld joint within the Brunswick Steam Electric Plant RPVs, and CP&L does not expect major deviations from the chemistry composition and resulting chemistry factors provided to the NRC in our previous responses to Generic Letter 92-01, Revision 1.

Although the NRC Reactor Pressure Vessel Integrity Database (RVID) was not available for public use until recently, an owners group database indicates several sister plants having used the same weld wire heat numbers as used in the BSEP-1 and BSEP-2 vessel weld joints. CP&L will be researching the NRC RVID, to further confirm sister plant identities and will work with those plants to share available weld chemistry and mechanical properties data.

## Beltline Materials Mechanical Properties:

### 1. Upper Shelf Energy (USE)

In February 1994, General Electric (GE) issued NEDO-32205-A, Revision 1 entitled, "Equivalent Margin Analysis for Low Upper Shelf Energy in BWR/2-6 Vessels," on behalf of the BWR Owners' Group. The purpose of the report was to demonstrate the existence of equivalent margins of safety as those required by 10 CFR 50, Appendix G for BWR vessels assuming materials with USE less than the screening criterion of 50 ft-lbs. This report addressed both plate and weld materials, but did not cover materials fabricated by the forging process.

In the Generic Letter 92-01 response, dated July 9, 1993 (Serial: BSEP 93-0110), CP&L indicated that each of the Brunswick Units had two forged instrument nozzles located at the approximate top of the beltline in the RPVs. While CP&L does not have measured unirradiated USE data for these nozzle materials, it was predicted that the end-of-license (EOL) mechanical properties changes due to radiation would be minimal for these components based on a very low predicted EOL 1/4t fluence [reported as  $1.6E17$  n/cm<sup>2</sup> ( $E > 1\text{MeV}$ )].

In 1994, CP&L completed testing of the first BSEP-1 surveillance capsule and subsequently updated vessel fluence projections. The results of these surveillance tests and the updated vessel fluence projections were reported to the NRC in Table 1 of the BSEP-1 surveillance report entitled, "Brunswick Steam Electric Plant Unit 1 Reactor Pressure Vessel Surveillance Program, Summary Report SR-BNP1-1005-001." This surveillance report was submitted to the NRC on August 17, 1994 (Serial: BSEP 94-0316).

In Table 1 of the referenced report, the updated EOL 1/4t fluence projection for the N16A and B instrument nozzles was reported as  $3.4E17$  n/cm<sup>2</sup> ( $E > 1\text{MeV}$ ). Although the referenced report only addressed BSEP-1, the projected EOL 1/4t fluence for the BSEP-2 nozzles would be nearly identical due to similarities in vessel design, operation, and fuel loading patterns.

Both BSEP-1 and BSEP-2 have currently operated approximately 10 effective full power years (EFPY). The predicted 1/4t fluence at the nozzles for 10 EFPY is  $1.22E17$  n/cm<sup>2</sup> ( $E > 1\text{MeV}$ ).

While the updated EOL fluence projections for the forged nozzles are higher than those reported in the July 9, 1993, letter to the NRC, both the current fluence (for 10 EFPY) and the EOL fluence projections remain well below the  $1E18$  n/cm<sup>2</sup> fluence limit shown for the USE drop trend curves in Figure 2 of Regulatory Guide 1.99 Revision 2. Accordingly, CP&L does not view the lack of initial USE data for these nozzles as an immediate safety concern for the Brunswick Plant vessels. However, over the next three months, CP&L will interface with the forging manufacturer in an attempt to acquire additional historical data on the unirradiated mechanical properties for these forgings. If sufficient data cannot be obtained to clearly determine/estimate unirradiated USE for the forgings, a plan will be provided in the November 19, 1995, Generic Letter response for developing a plant-specific equivalent margins analysis for these nozzles.



## 2. Initial $RT_{NDT}$ Determination for BSEP Reactor Vessel Materials

When the BSEP vessel materials were fabricated (prior to 1972), the Code requirements for Charpy testing/reporting were different from those in the current ASME Code and NRC regulations. Therefore, like many early plants, Brunswick has limited unirradiated Charpy data reported for the beltline materials. Although the beltline materials do have reported nil-ductility transition temperature (drop weight NDT) test and Charpy test results, in most cases the reported data is not sufficient to establish Initial  $RT_{NDT}$  in accordance with current ASME Code practices.

In an effort to resolve such questions regarding Initial  $RT_{NDT}$  determination, GE submitted to the NRC two reports on behalf of the BWR Owners' Group describing/justifying a methodology for use in establishing Initial  $RT_{NDT}$  (BWROG Reports GE-NE-523-109-0893 and NEDC-32399-P entitled, "Basis for GE  $RT_{NDT}$  Estimation Method").

In a letter to CP&L dated April 1, 1994, the NRC indicated that since past practices used by CP&L for establishing Initial  $RT_{NDT}$  had not been "validated," CP&L could either commit to the GE methodology (under NRC consideration/review at the time) or submit a schedule for resolving the issue. In the letter response to the NRC dated May 13, 1994 (Serial: BSEP 94-0179), CP&L indicated that unless more accurate  $RT_{NDT}$  data were derived, the GE methodology for determining Initial  $RT_{NDT}$  would be used for future submittals once it was finally approved by the NRC. In the same letter response, CP&L provided a preliminary assessment, based on application of the GE methodology to BSEP-1 and BSEP-2 beltline materials. CP&L further committed to providing a final assessment, once the NRC gave final approval of the GE methodology. The NRC provided final approval of the GE methodology on December 16, 1994.

CP&L is currently completing the final assessment based on application of the GE methodology to the Brunswick vessel materials (or other NRC approved methodologies such as that described in Branch Technical Position MTEB 5-2, etc). This assessment will be completed within the next couple of months, and the results reported in the November 19, 1995, response to this Generic Letter.

### Summary Plan:

CP&L is currently participating in industry efforts (e.g., BWRVIP, EPRI, and other utilities) in seeking information relative to RPV integrity and will continue to assess the potential benefits of participation in such activities. Although the BWRVIP is working towards developing a coordinated response to this Generic Letter, CP&L will also continue its own efforts to locate additional RPV integrity data pertinent to the Brunswick vessels. Additionally, CP&L will provide a response to Parts 2, 3, and 4 of Generic Letter 92-01 Revision 1, Supplement 1 by November 19, 1995, as requested, based on available data at the time of response. However, final resolution of materials questions, necessitating consideration of "all" relevant industry data, may not be possible prior to completion of the BWRVIP effort (24 month schedule).

The following CP&L actions are planned to support this effort:

- (1) Information concerning the Brunswick reactor vessel beltline materials is contained in GE reports NEDO-24161 Revision 1 (BSEP-1) and NEDO-24157 Revision 2 (BSEP-2). An extensive effort was conducted by CP&L and GE in 1994 to verify and correct the information in these reports. CP&L, therefore, does not anticipate significant changes resulting from future data searches. However, readily available information on reactor

pressure vessel integrity and records from sources such as BSEP-1 and BSEP-2 quality assurance records, the RPV fabricator, NRC RVID, industry/owners group databases, and other domestic utilities (i.e., sister plants) will be reviewed. If additional relevant information is discovered, it will be submitted to the NRC in the November 1995 Generic Letter response.

- (2) Sister plant(s) having the same beltline SAW weld material heat numbers will be confirmed and requested to share pertinent test data, chemistry analyses etc. to the extent the information is readily available and non-proprietary. Conversely, if requested, CP&L will share available information regarding material properties for the RPV with sister utilities. Newly acquired data will be evaluated for its impact on prior NRC submittals regarding BSEP-1 & 2 reactor vessel integrity.
- (3) CP&L will consider the impact of any newly acquired data on variables pertaining to RPV integrity [e.g. unirradiated  $RT_{NDT}$ , unirradiated USE, best estimate chemistry compositions, chemistry factors, adjusted nil-ductility transition reference temperature ( $ART_{NDT}$ ), and USE at EOL]. Such impact will be reported, as requested by Supplement 1 of the Generic Letter.
- (4) A determination will be made on the need to use the "ratio procedure" for the BSEP-1 and BSEP-2 vessels as described in Regulatory Guide 1.99, Revision 2, Position 2.1.
- (5) A response will be provided to the NRC summarizing any newly acquired data that significantly affect the RPV integrity parameters such as  $ART_{NDT}$  or USE at EOL. This response will also address potential impact of the data on the operating P-T limits, as applicable. Based on safety significance, the response will also provide a plan for completing the assessment of these vessel parameters (e.g., plant-specific USE equivalent margins analysis for instrument forgings, etc.) and any necessary revision of operating limits and setpoints.