



UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D. C. 20555-0001

Enclosure

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO SHORT TERM STRUCTURAL INTEGRITY CRITERIA

CAROLINA POWER & LIGHT COMPANY

BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2

DOCKFT NOS. 50-325 AND 50-324

INTRODUCTION

On April 21, 1992, Carolina Power & Light Company (CP&L), the licensee, shut down both units of the Brunswick Steam Electric Plant (BSEP) due to the widespread anchoring deficiencies identified in the plant. A significant number of additional issues were subsequently identified by the licensee during its followup investigations and by the NRC. In a letter dated April 27, 1992, the NRC staff requested further information from the licensee concerning the anchor bolt deficiencies and its proposed corrective actions for the deficiencies, as well as its short-term structural integrity (STSI) criteria proposed for piping and pipe supports under seismic loading conditions. In its Safety Evaluation (SE) issued to the licensee on October 8, 1993, the staff indicated that the STSI criteria of CP&L are acceptable for performing the operability assessment of piping and pipe support systems. The criteria were based on the CP&L Design Guide (DG) II-20, Revision 2. This DG also makes references to CP&L Study Report M-20, "Criteria for Evaluating and Performing Computerized Piping Analyses of Existing Systems with Minor Modifications," Revision 2, and the CP&L Study Report M-21, "Evaluation and Design Criteria for Existing Pipe Supports Associated with NRC Bulletins IE 79-02, 79-14 for Modification to or Design of Pipe Supports," Revision 1.

As stated in a letter from D. McCarthy to the NRC dated April 1, 1993, the licensee issued Revision 4 to DG II-20 on October 24, 1992, and requested the staff's review and acceptance of the STSI criteria on the basis of the latest revision of DG II-20. A meeting between the licensee and the staff was held at the NRC headquarters on April 1, 1993, to discuss the issues. Additional questions were raised by the staff during the meeting.

The NRC staff has performed the review of this revised DG II-20, in the areas of piping and pipe supports. The staff also reviewed the licensee's responses to the additional staff questions provided in its letter of April 19, 1993. Specifically, the staff evaluated the adequacy of the stress allowables used by the licensee for short-term operability assessment and the adequacy of the loading combinations used in making such an assessment.

Questions were also raised by the staff regarding the evaluation of the STSI items due to corrosion, as well as cumulative effects of STSIs. The following evaluation includes the results of the review of these issues.

EVALUATION

Design Guide II-20

The previous staff review of DG II-20, Revision 2, and Study Report M-20 indicated that combining transient loadings in the operability equations for piping systems is a procedure committed to by the licensee. The staff review of Revision 4 of DG II-20 found, however, that transient loadings are not included with the corresponding seismic load in the loading equations for operability assessment. Responding to the staff's question, the licensee reviewed its computer output, "Stress Report Generator," and recognized that in plant piping analyses this loading combination would be automatically performed when a transient loading is provided. To resolve this discrepancy, the licensee has committed to further revise DG II-20 to reflect the existing procedural requirements of Study Report M-20.

Based on the information provided in DG II-20 and in the licensee's April 19, 1993, response to the questions raised at the April 1, 1993, meeting, we find that in the proposed STSI criteria references were generally made to the requirements of NRC Generic Letter (GL) 91-18, "Information to Licensees Regarding Two NRC Inspection Manual Sections on Resolution of Degraded and Nonconforming Conditions and on Operability." Generic Letter 91-18, in turn, makes reference to Appendix F, "Rules for Evaluation of Service Loadings with Level D Service Limits," American Society of Mechanical Engineers Code (ASME Code), Section III, 1986 Edition, for operability requirements of piping and pipe supports. The part of STSI criteria that conforms to the requirements of GL 90-18 and, thus, Appendix F are stress allowables for piping, as well as those for pipe supports, in terms of tension, shear, bending, compression, bolt, and component standard support. These specific stress allowables are consistent with the interim operability criteria accepted by the staff at other plants and are acceptable.

DG II-20 also proposes the use of $.48 S_u$, as the weld stress allowable. This is based on the shear allowable presented in the commentary on the American Institute of Steel Construction (AISC) Specification, Section 1.5.1.2, using a ratio of 1.2 between S_u and S_y for weld metal. Here, S_u and S_y are, respectively, the ultimate and yield strength of the weld. The staff finds this to be acceptable for operability assessment. For snubbers, U-Bolts, and EA3 off-axis clamps, DG II-20 lists vendors' published allowable loads. These allowable loads are consistent with those originally provided in Study Report M-21, and are acceptable.

The NRC staff has previously approved factors of safety of 2.0 for expansion anchors and 1.4 for Nelson studs attached to embedded plates, as proposed by DG II-20, for short-term operability assessment at other plants. These factors of safety are, therefore, also acceptable for use at BSEP. For

non-pipe supports, DG II-20 proposed a stress allowable of 1.6 times normal stress allowable. This is found to be in conformance with the requirements of the NRC's Standard Review Plan, Section 3.8.4, and is acceptable.

The licensee has indicated its intention to use tested mechanical properties or data listed on certified mill test reports rather than the minimum ASME Code specified material strength. In an April 13, 1993, conference call, the staff informed the licensee that the use of these for defining material properties is not acceptable to the NRC for interim operability evaluation. The licensee has, thus, committed to further revise DG II-20 to eliminate the option of using such test data.

Based on the above evaluation, the staff concludes that, with the exceptions of the issues regarding transient loadings and tested material properties that need to be further clarified, DG II-20, Revision 4, is considered acceptable for STSI assessments for BSEP.

Corrosion Effects

In the licensee's April 19, 1993, response to the NRC staff's questions regarding the evaluation of STSI items subjected to corrosion, the licensee stated that numerous corrosion repairs have been completed in the service water building and reactor building during the current outage. For other STSIs where corrosion repairs are not yet performed, the licensee has evaluated the significance of corrosion and determined that the affected STSIs will perform satisfactorily for the next eighteen months. With the licensee's commitment to complete the necessary corrosion repairs as identified in the Brunswick Three-Year Plan, the NRC staff finds the licensee's approach to resolving the corrosion-related STSI issue to be acceptable.

Cumulative STSI Effects

The staff requested the licensee to make an evaluation of the potential effects of more than one STSI in a system or a structure on the cumulative reduction of safety margin in the system or structure. The licensee identified eight situations having such potential cumulative effects. For five of these situations, the licensee determined that the total margin of safety is not compromised. For the remaining three situations, the licensee found that each of the systems or structures as a whole meets the minimum operability criteria. Based on the licensee's commitment to bring the STSIs into compliance with the FSAR criteria as detailed in the Brunswick Three-Year Plan, the staff considers the licensee's evaluation of the cumulative effects of the STSIs to be acceptable.

CONCLUSION

Based on the information provided by the licensee, the staff finds DG II-20, Revision 4, to be an acceptable criteria document for BSEP STSI assessments upon the correction of the loading equations to include all pertinent transient loadings and the elimination of the option of using tested mechanical properties. The staff also finds that the licensee has adequately addressed the effects of corrosion on STSI items, and adequately ensured that

the cumulative safety impact of items qualified under the STSI criteria and left in service when the units restart will remain acceptable. Based on the above, the staff concludes that once the above mentioned corrections on DG II-20 are made, the licensee's STSI criteria will be considered acceptable for use at BSEP.

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Date: April 23, 1993