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**DUKE POWER**

January 30, 1992

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

Subject: Catawba Nuclear Station, Units 1 and 2  
Docket Nos. 50-413 and 50-414  
NRC Bulletin 88-11  
Pressurizer Surge Line Thermal Stratification

Gentlemen:

By a letter dated August 1, 1991, the NRC issued a Safety Evaluation Report (SER) on the Westinghouse Owners Group (WOG) Pressurizer Surge Line Thermal Stratification Generic Detailed Analysis (WCA-P-12639). The SER advised Duke Power that the WOG program results could be used to satisfy items 1.c and 1.d of the bulletin for Catawba Nuclear Station, provided that plant specific applicability is demonstrated and additional evaluation requirements as specified within the SER are performed. The August 1, 1991 letter also requested that Duke submit the results within 30 days of completing the analysis.

The analysis was completed on December 31, 1991. Accordingly, please find attached a summary of the results of Duke's analyses for Catawba Nuclear Station. The results of the analyses confirm the adequacy of the existing design for Catawba.

Please be advised that all actions requested by Bulletin 88-11 of licensees of operating PWRs (Items 1.a through 1.d) have been completed for Catawba Nuclear Station. Details of the inspections, analysis and evaluations performed in support of responding to this bulletin are available for inspection.

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If there are any questions regarding the information provided in response to Bulletin 88-11, please contact Chuck Lewis at (803) 831-3076.

I declare under penalty of perjury that the statements set forth herein are true and correct to the best of my knowledge.

Very truly yours,



M. S. Tuckman

Attachment

CRL/B8811RSP.NRC

xc: S. D. Ebnetter  
Regional Administrator, Region II

W. T. Orders  
Senior Resident Inspector, Catawba

R. E. Martin, Senior Project Manager  
ONRR

**DUKE POWER COMPANY  
CATAWBA NUCLEAR STATION  
RESPONSE TO BULLETIN 88-11  
PRESSURIZER SURGE LINE THERMAL STRATIFICATION**

All analyses and evaluations required for NRC Bulletin 88-11, Pressurizer Surge Line Thermal Stratification, are complete. Results of the analyses confirm the adequacy of the existing designs. A summary of the actions taken for final closure of NRC Bulletin 88-11 for Catawba Nuclear Station follows. The summary is presented in four parts: Background, SER Applicability Requirements, SER Plant Specific Evaluations, and Additional Evaluations.

**BACKGROUND**

NRC Bulletin 88-11 required utilities to take action to confirm the structural adequacy of the pressurizer surge line considering the effects of thermal stratification and thermal striping. Generic tasks required by NRC Bulletin 88-11 were performed under the auspices of the Westinghouse Owners Group. The results of the Westinghouse Owners Group program were summarized in WCAP 12639, "WOG Pressurizer Surge Line Thermal Stratification Generic Detailed Analysis." The NRC transmitted the staff's SER on the WCAP 12639 with a letter to M.S. Tuckman dated August 1, 1991. The SER stated that for Catawba Units 1 & 2, "the WOG generic detailed analysis results can be used to satisfy the requirements of NRC Bulletin 88-11, Actions 1.c and 1.d, provided that plant specific applicability is demonstrated and additional evaluations which were not included as part of the WOG program are performed.

Applicability requirements include:

- Review of operating records to ensure that system  $\Delta$ -T limits assumed in the analysis were not exceeded,
- Verification of operational methods to ensure that they are consistent with the methods assumed in the analysis (Limits on system  $\Delta$ -T for future operation are recommended), and
- Verification of applicability of seismic OBE bending moments used in the fatigue analysis and combined deadweight and OBE moments at the hot leg nozzle.

Additional plant specific evaluations to be performed include:

- Evaluation of adequacy of pipe support[s for] loads and displacements,

- Evaluation of effects of stratification on stress and fatigue at integral welded attachments (lugs, plates, etc.), and
- Evaluation of effects of stratification on stress and fatigue of the pressurizer nozzle.

## **APPLICABILITY REQUIREMENTS**

**Requirement 1. Review operating records to ensure that system  $\Delta$ -T limits assumed in the analysis were not exceeded.**

The Catawba operating records were reviewed. No occurrences were found of system  $\Delta$ -T exceeding 320°F; or, of fill and vent  $\Delta$ -T greater than 150°F. The system  $\Delta$ -T limits assumed in the WOG generic analysis are applicable for past Catawba operation.

**Requirement 2. Verify operational methods to ensure that they are consistent with the methods assumed in the analysis. Limits on system  $\Delta$ -T for future operation are recommended.**

The maximum administratively controlled pressurizer to RCS  $\Delta$ -T at Catawba is 260°F. This value is enveloped by the 320°F assumed in the analysis. The Catawba operating methods are consistent with the methods assumed in the WCAP 12639 analysis.

**Requirement 3. Verify the applicability of seismic OBE bending moments used in the fatigue analysis and combined deadweight and OBE moments at the hot leg nozzle.**

A unit specific analysis has been completed for the Catawba Unit 1 and Unit 2 surge lines. The analyses confirm that the seismic OBE bending moments for the Catawba Unit 1 and Unit 2 surge lines are less than the 1731 in-kips used in the WCAP 12639 analysis (reference pg 9-14 of WCAP 12639.) The combined deadweight and OBE inertia moments are less than 1847 in-kips (reference pg 9-21 of WCAP 12639).

## **PLANT SPECIFIC EVALUATIONS**

**Evaluation 1. Evaluate adequacy of pipe support[s for] new loads and displacements.**

Results of the unit specific analyses confirm that all pipe support loads and displacements remain within applicable design limits. Each Catawba unit surge line is supported by one spring, one snubber and one rigid (three supports per unit; six total for the station). Loads and displacements for each support under all loading

conditions were evaluated. Supporting structural attachments were also reviewed. All applicable design limits were satisfied.

**Evaluation 2. Evaluate the effects of stratification on stress and fatigue at integral welded attachments (lugs, plates, etc.)**

Integral welded attachments are not used on the Catawba surge lines. This SER evaluation is not applicable to Catawba Nuclear Station.

**Evaluation 3. Evaluate the effects of stratification on stress and fatigue of the pressurizer nozzle.**

As noted in our July 15, 1991, letter to the NRC staff, Westinghouse has completed an analysis of the pressurizer surge nozzle accounting for the effects of stratification. The analysis confirms that the pressurizer nozzle satisfies all applicable stress and fatigue limits considering the effects of stratification.

**ADDITIONAL EVALUATIONS**

In addition to the applicability and plant specific evaluations included in the SER, the following was also evaluated:

1. The new maximum pipe movements against available rupture restraint gaps,
2. The effect of stratified movements on rupture restraint blowdown loads; and,
3. Effect of stratification on postulated break locations.

**Additional Evaluation 1.**

The new maximum pipe movements resulting from the combination of uniform expansion, stratification, SSE and LOCA were evaluated against the available rupture restraint gaps. For Catawba Unit 1, contact was predicted at one rupture restraint. The effects of the contact were evaluated with respect to the pipe, the rupture restraint device, and the pipe supports. The components evaluated are structurally adequate considering the effects of the predicted contact. All other devices on unit 1 and all devices on unit 2 were found to have adequate clearance for all loading conditions.

**Additional Evaluation 2.**

The effect of stratified movements on rupture restraint blowdown loadings was evaluated. (Rupture restraint loadings are a function of the hot gap.) Existing

blowdown loads remain adequate when considering the new thermal expansion movements associated with thermal stratification.

### **Additional Evaluation 3.**

The effects of stratification on postulated break locations was evaluated. Final stress and fatigue results, including the effects of stratification, were reviewed and resulted in no new postulated break locations.