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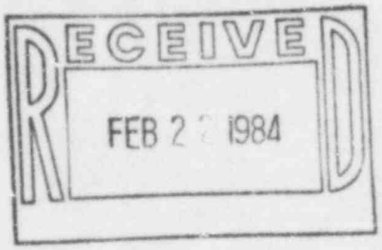

Mr. John T. Collins
Regional Administrator, Region IV
Nuclear Regulatory Commission
611 Ryan Plaza Dr., Suite 1000
Arlington, Texas 76012

Dear Mr. Collins:

South Texas Project
Units 1 & 2
Docket Nos. STN 50-498, STN 50-499
Second Interim Report Concerning the
NSSS Model Used in Seismic Analyses

On July 27, 1983, pursuant to 10CFR50.55(e), Houston Lighting & Power Company (HL&P), notified your office of an item concerning the Nuclear Steam Supply System (NSSS) model used in the seismic analyses for the South Texas Project (STP). On August 26, 1983, our First Interim Report (reference: ST-HL-AE-977) described this deficiency and summarized our plans for evaluation and resolution. Attached is the Second Interim Report. The next report will be submitted to your office by April 27, 1984.

If you should have any questions concerning this item, please contact Mr. Michael E. Powell at (713) 993-1328.

Very truly yours,

G. W. Oprea, Jr.
Executive Vice President

MEP/mpg
Attachment: Second Interim Report Concerning the
NSSS Model Used in Seismic Analyses

W2/NRC2/j

IE-27

cc:

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Revised 12/21/83

South Texas Project
Units 1 & 2
Second Interim Report Concerning the
NSSS Model Used in Seismic Analyses

I. Summary

A concern was identified earlier regarding the Nuclear Steam Supply System (NSSS) model used in seismic analyses. The concern was raised because the seismic acceleration response spectra developed from a new analysis using an updated model for the STP NSSS system exhibited increased amplification at some locations. Westinghouse (W) has reviewed the resultant response spectra and concluded that there is no effect on the existing design of the NSSS equipment and the Reactor Coolant Loop (RCL) piping within the W scope of responsibility.

Bechtel is currently developing the response spectra at the nozzle attachment points for the RCL Class 1 branch piping in order to evaluate the effect of the W NSSS updated model on the seismic design of that piping.

II. Description of the Deficiency

On July 27, 1983, pursuant to 10CFR50.55(e), Houston Lighting & Power Company (HL&P) notified the NRC Region IV of an item concerning the NSSS model used in the seismic analyses for the South Texas Project. There are differences in the NSSS model submitted by W and that originally developed by EDS Nuclear, Inc. (hereafter EDS) during the preliminary STP design activities for seismic analyses. In 1981, HL&P and Brown & Root (B&R) undertook efforts with W to verify the set of NSSS data used by EDS for the seismic response of the Reactor Containment Building (RCB) structure, which was then extended as input for the site-specific seismic analyses of the NSSS equipment by W.

These verification reviews established that although W recommended that a more detailed, representative NSSS model should be used for such analyses, the effect of using the simpler model (as developed by EDS) was insignificant for the purposes of evaluating the seismic response of the RCB structure and NSSS proper. Accordingly, the prior analyses were judged to be acceptable.

However, it was noted that although the RCB structural response would be unaffected by the more detailed modeling, it was not clear that NSSS associated piping would also be unaffected. Therefore, HL&P identified to Bechtel during its transition as the new architect/engineer, that action should be undertaken to investigate the effect of the W recommended updated NSSS model on the NSSS associated piping.

Accordingly, Bechtel has developed the new seismic response spectra based on the W updated model utilizing the design-basis analyses by two-step finite element method (FEM) for soil-structure interaction (SSI) and

including the effect of SSI by the elastic half-space (EHS) method of analysis. It was determined that, in general, (1) the design-basis spectra at the NSSS structural support points envelope the new spectra except in the low frequency range of less than 4 cps for the horizontal response and in the high frequency range of 15 to 30 cps for the vertical response at elevations 19 ft and 37 ft of the RCB interior structure, and (2) the new response spectra at points corresponding to the interface between the NSSS equipment and the steel intermediate supports within the W scope are significantly amplified.

These new comparative response spectra were submitted to W to confirm the earlier judgement that the effect on the NSSS proper would be insignificant. W has concluded that the limited increases in spectral response restricted to the low frequency range and to the two locations as defined in item (1) above, are of no adverse impact on the NSSS loop or primary equipment, and that the amplified spectra at the interface points defined in item (2) above were not used for any site-specific seismic analyses of the NSSS. For the site-specific seismic analyses of the NSSS equipment W used the response spectra at the concrete/support interface and since the W model included the support/NSSS equipment interface, the amplified spectra are inconsequential.

It was also determined by Bechtel that since the updated NSSS model appeared to be slightly more flexible than the previous NSSS model, the seismic spectral response at attachment points of RCL branch piping could be potentially subject to amplification within the frequency range of the NSSS. The effect of this potentially amplified seismic response used as input for the seismic analysis of Class 1 branch piping by Bechtel, has not been fully evaluated at this time.

III. Corrective Action

As indicated above, W has stated that the revised spectra will not result in any change in the existing design of the NSSS. However, in order to address the implications of the potentially amplified response on the RCL branch piping design, Bechtel is computing the corresponding response spectra at attachment points within the RCL. The computation incorporates the updated NSSS model and utilizes the design-basis analyses by two-step FEM for SSI as well as the EHS method for SSI. It should be noted that the need for these remaining analyses results from the amplified responses predicted because of the updated NSSS model, and is not a result of the additional evaluation of this model using the EHS method of analysis. The resultant spectra will be used as the basis for the final determination of the effects of the updated model and the EHS method on the RCL branch piping.

As a possible aid for this determination, a separate seismic response analysis is being performed in parallel using the methods described in Standard Review Plan Section 3.7.2, item II.4.a, pertaining to the enveloping of solutions by EHS and single-step FEM for SSI. The separate analysis will define the seismic response which is predicted when the current methodology consistent with the NRC criteria and the updated NSSS model are used. The Bechtel methods for such analytical development were previously presented to the NRC as part of the overall disposition of NRR

question 220.08 on STP soil-structure interaction analyses. Preliminary assessment by Bechtel indicates that the separate analysis will demonstrate that adequate margin exists in the previous seismic design of the RCL branch piping.

IV. Safety Analysis and Recurrence Control

It has been identified that the design-basis spectra envelope the new spectra except in the low frequency range of less than 4 cps for the horizontal response and in the high frequency range of 15-30 cps for the vertical response at certain specific locations on the RCB interior structure. No deficiencies with equipment, piping or support design has been identified to date as a result of Bechtel and Westinghouse evaluations.

The safety significance of any discrepancy and the needs for recurrence control will be addressed in the next report.