

SEABROOK STATION
Engineering Office:
20 Turnpike Road
Westborough, MA 01581

August 28, 1980

SBN-135
T.F. Q 2.2.2

U.S. Nuclear Regulatory Commission
Region I
631 Park Avenue
King of Prussia, Pennsylvania 19406

Attention: Office of Inspection and Enforcement

Reference: 1. Docket Nos. 50-443 and 50-444
2. 10 CFR 50.55 (e) Interim Report dated 12.6.79
3. 10 CFR 50.55 (e) Interim Report dated 5/30/80

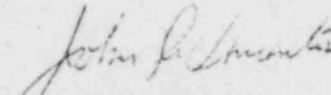
Subject: 10 CFR 50.55 (e) Final Report on Use of Invalid Seismic Amplified
Reponse Spectra

Dear Sir:

Interim reports on the subject 10 CFR 50.55 (e) were filed with your office on 12/6/79 and 5/30/80. The enclosed final report is submitted in accordance with the requirements of 10 CFR 50.55 (e). This deficiency was originally reported to the Region I Inspection and Enforcement Office by telephone on 11/6/79.

Should you require additional information at this time on this matter, please contact us.

Very truly yours,


John DeVincentis
Project Manager

JDV:tan

cc: Director of Inspection and Enforcement
US NRC, Washington, D.C. 20555

Enclosure

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SEABROOK PROJECT
FINAL REPORT
ON
USE OF INVALID SEISMIC AMPLIFIED RESPONSE SPECTRA

Introduction

On Tuesday, November 6, 1979, Mr. J. DeVincentis, Seabrook Project Manager for Yankee Atomic Electric Company, reported by telephone to Mr. J. Mattia, NRC Region I Inspection and Enforcement inspector for the Seabrook Project, a significant design deficiency under 10 CFR 50.55(e). YAEC had that same day received written notice of the deficiency from the Seabrook architect-engineer-construction manager, United Engineers & Constructors, Inc., under UE&C letter number SBU-31426.

This design deficiency involved the use of invalid seismic Amplified Response Spectra (ARS) in the design of components supported by the containment building annular steel framing.

An interim report on this subject was submitted on December 6, 1979, with Public Service Company of New Hampshire (PSNH) letter number SBN-106. This interim report committed a final report to be submitted on June 1, 1980. PSNH letter number SBN-121 of May 30, 1980 gave a status of committed actions and re-scheduled the final report to be submitted by September 1, 1980.

This report will give the final status of the actions committed to in the Interim Report and will also detail further corrective action UE&C is undertaking as a result of the design deficiency.

The following Corrective Action commitments are quoted from the Interim Report:

Corrective Action

1. UE&C is conducting a short-term audit of selected seismic Category I systems and components to assure use of correct Amplified Response Spectra in their seismic design.
2. Containment building annular steel frame is being redesigned to increase its rigidity. The intent is to reduce the values of the ARS imposed on the piping systems and other components supported by the annular steel frame.
3. A "HOLD" has been placed on the design and analysis of piping systems located in the containment annulus.
4. UE&C will conduct a longer term audit of all seismic Category I systems and components to assure use of correct ARS in their seismic design.
5. When the redesign of the annular steel framing is complete, a seismic analysis of it will be performed, generating new ARS at significant individual points.
6. Existing analyses of Safety Class 2 and 3 piping running in the containment annulus will be reviewed against ARS generated in #5 above.

Where necessary, piping will be reanalyzed to assure conformance with applicable Code and regulatory requirements.

7. UE&C is currently reviewing the seismic design requirements of all other components supported by the containment annular steel frame. They are the following:
 - a. Containment Recirculating Air Units:
These would be used for post-LOCA hydrogen mixing and are Safety Class 3.
 - b. Containment Cooling Units:
These are non-safety-related, non-seismic Category I. However, they will be seismically designed since they are located in a seismic Category I building.
 - c. Hydrogen Recombiners:
There are two thermal-type recombiners mounted on the annular steel frame. They are safety Class 3, seismic Category I.
 - d. Cable Trays and their Support Systems:
Tray supports are seismic Category I.
 - e. Heating, Ventilating and Air Conditioning Ductwork Systems:
These are a mixture of Category I and non-Category I systems.
 - f. Air Compressors:
Two small non-Category I units for instrumentation and control supply.
8. Existing UE&C procedures involving seismic design, especially those treating Amplified Response Spectra, are under review to determine the need for revisions or additions which will upgrade them in areas of selection, use and review of ARS.
9. Quality Assurance training sessions, in addition to those on the regular schedule, are planned on the subject of ARS treatment for all UE&C personnel who interface with ARS.

Correction Action

The following is the status of the corrective action commitments as listed above:

1. The short term audit (UE&C internal audit number NH-314) of selected seismic Category I systems and components has been completed. Project engineering has responded to all findings and the responses have been accepted by the auditors. Several corrective actions remain to be verified; however, no findings require corrective action in the form of structural modifications or major modifications to piping and pipe supports.
2. Redesign of containment annular steel has been completed. All original design drawings in this area have been voided and design calculations redone.

3. The "HOLD" placed on design and analysis of affected piping systems has been removed since updated amplified response spectra for the containment building annular structural steel are now available. The seismic analyses of these piping systems are being reviewed to determine the effect of the revised ARS. It is anticipated that no changes will be required in piping configuration; however, certain lines will require additional supports.
4. The longer term audit (UE&C internal audits numbers NH-350 and NH-351) has been completed. Preliminary responses have been prepared for all findings on components. It is anticipated that corrective action will not require physical change to any component.

Findings on piping systems have been reviewed. Based on this review and on the results of the "short term" audit described above, it is anticipated that corrective action will not require modifications to piping configurations.

Detailed corrective action and its verification will be determined during the Seismic Verification Program discussed below.

5. The seismic analysis of the redesigned annular steel framing has been completed. Generation of the new amplified response spectra for the steel frame has been completed.
6. & 7. Review of analysis and seismic design requirements of Safety Class 2 and 3 piping and other components supported by the annular steel frame is under way. This review is in conjunction with the Seismic Verification Program discussed below.
8. A new Seabrook Administrative Procedure No. 36 (AP-36), "Control of Seismic Design", has been prepared and issued to all UE&C personnel involved in this aspect of the Seabrook plant design.
9. An initial training session on the use of AP-36 for all UE&C personnel who interface with ARS used on the Seabrook project was held on June 4, 1980.

Seismic Verification Program

The UE&C internal audits (NH-314, NH-350 and NH-351) cited above, showed that there are no other areas in the plant where the seismic analysis of a group of local systems and components was based on seismic amplified response spectra of a different structure, as was the case of the piping and components supported by the containment annular steel. However, UE&C has undertaken a verification program ("Seismic Verification Program") to ensure that the seismic design and analyses for all seismic Category I systems and components is based on input derived from the final design of those systems and components. In addition, the seismic analyses for all Category I systems are being reviewed for correctness. Major design and analytical input being reviewed includes, but is not limited to, the following:

- a. Location of pipe and component supports.
- b. Type and function of pipe and component supports.
- c. Seismic amplified response spectra at all pipe and component support points.

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The program will not address the analysis of Safety Class I components and piping for which the NSSS supplier is responsible. However, it has been confirmed that the UE&C generated amplified response spectra for the containment structure used by Westinghouse in their analysis is correct and up-to-date.

Due to the nature of the verification program, the program cannot be concluded without the final, as-built plant data. The verification program which is currently in progress would systematically identify the input ARS design parameters that have been used in the design for all safety related systems and components such that, should a defect be uncovered as a result of the program, corrective actions can be simultaneously initiated. The corrective actions in general would consist of stiffening of a floor, a column, or of a beam, or reanalysis to examine design margins, or relocation of components as necessary. The completion of this verification program and corrective actions resulting will constitute final closeout of corrective action items 4, 6 and 7 noted above.

The verification program is scheduled to be complete before fuel loading.