Docket File

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

February 7, 1992

Docket No. STN 50-455

Mr. Thomas J. Kovach
Nuclear Licensing Manager
Commonwealth Edison Company-Suite 300
OPUS West III
1400 OPUS Place
Downers Grove, Illinois 60515

Dear Mr. Kovach:

SUBJECT: IMPLEMENTATION OF SEISMIC STOPS AT BYRON NUCLEAR STATION, UNIT 2 (TAC NO. M74116)

Reference: Letter, P. C. Shemanski, NRC, to T. J. Kovach, CECo, dated May 21, 1990.

In the reference letter, the staff provided a safety evaluation (SE) regarding the implementation of "seismic stops" at Byron Unit 2. The SE concluded that this implementation, via a demonstration in a pilot study, was conditionally acceptable subject to the satisfactory resolution of the following two conditions:

1. An independent confirmatory analysis to verify the linearization methodology and results of the program GAPPIPE, as applied to the piping system chosen for the pilot study.

2. A detailed inspection of the installed seismic stops during the first outage after installation.

The Brookhaven National Laboratory (BNL), as consultant to the staff, has performed an independent confirmatory analysis of the piping system selected for the pilot study. This analysis was performed using the computer program ANSYS, which has the capability to perform both linear and nonlinear dynamic analyses of piping systems.

Two studies were performed: (a) a time-history analysis (THA) using a non-linear gap capability, and (b) a linear envelope response spectrum analysis (LERSA) in which the seismic stops were assumed to be either completely closed at all times (in which case they behave as rigid supports), or infinitely open at all times (in which case they were assumed not to exist). The time-history used in the non-linear analysis was developed by BNL from floor response spectra provided by Robert L. Cloud and Associates (RLCA).

The THA was partially successful in verifying the GAPPIPE results. Pipe displacements and stresses were calculated of the same order of magnitude as GAPPIPE and, therefore, compared reasonably well. However, forces and moments in vertical supports and anchors were calculated considerably larger than the GAPPIPE values or what could reasonably be judged as valid. The reasons for these deviations are not clear but appear to be related to the time-step which

was used in the numerical solution process, a well-known critical factor in the successful application of non-linear time-history dynamic analysis.

The LERSA, based on the spectra provided by RLCA, provided results which bracketed the GAPPIPE results. The calculation with the closed gaps indicated generally higher support loads and lower anchor forces than GAPPIPE, while the calculation with the infinite gaps, i.e., no supports, indicated generally higher anchor loads than GAPPIPE.

Both the THA and the LERSA loads in the seismic stops were calculated to be lower than the GAPPIPE loads. Since the GAPPIPE methodology linearizes the stiffness of the seismic stop supports, the final stop loads are determined by increasing the linearly calculated stop loads by factors which are based on the actual stiffness of the stop supports. We find this procedure acceptable.

Based on the evaluation of these results, it was concluded that additional expenditure of resources for verification of the GAPPIPE results using ANSYS, or any other non-linear program, was not warranted at this time. It was also concluded that the response spectrum analysis results represent an adequate confirmatory analysis satisfying Condition 1 stated above.

CECo has also proposed to apply the GAPPIPE methodology at Byron Unit 2 to determine the effect on flexible piping of possible interference with adjacent walls or equipment. We find the proposed use of this methodology for this purpose acceptable.

Based on our independent analysis, we find the application at Byron Unit 2 of the linearization methodology of GAPPIPE to the evaluation of piping systems with seismic stop supports acceptable.

However, the implementation of seismic stops in other systems, beyond those chosen for the pilot study, will require satisfactory resolution of Condition 2 stated above. Other conditions regarding damping and the independent support motion capability of GAPPIPE were stated previously in the reference letter.

During the conference call with NRC staff on August 22, 1991, CECo indicated that installation of the seismic stops at Byron Unit 2 will be performed during refueling outage B2R04 currently scheduled for fall 1993. If there is a change of plan, the staff should be informed immediately.

Sincerely,
Original Signed By:
Anthony H. Hsia, Project Manager
Project Directorate III-2
Division of Reactor Projects - III/IV/V
Office of Nuclear Reactor Regulation

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