



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

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November 4, 1996

Mr. Nicholas J. Liparulo, Manager  
Nuclear Safety and Regulatory Activities  
Nuclear and Advanced Technology Division  
Westinghouse Electric Corporation  
P.O. Box 355  
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SUBJECT: THREE MAJOR ISSUES RESULTING FROM THE CIVIL ENGINEERING AND  
GEOSCIENCES BRANCH (ECGB) REVIEW OF THE WESTINGHOUSE AP600 ADVANCED  
REACTOR DESIGN

Dear Mr. Liparulo:

As a result of the Nuclear Regulatory Commission ECGB review of the seismic design of the AP600 nuclear island structures (including the foundation mat), and the leak-before-break issue, three major issues were identified. These issues are documented in the draft safety evaluation report for the AP600 design, and have been discussed extensively with the Westinghouse staff. Because of the different viewpoints between the staff and Westinghouse, and in order to meet overall review schedule, the staff indicated the possible resolution for these items. Provided below is the technical staff's positions on the three issues.

1. Site Conditions - Shallow Soil Site

The staff position is that the AP600 seismic design capacity could be established through the use of a sufficient and necessary set of minimum seismic design response spectra, including the free field and in-structure response spectrum envelopes, by the combined license applicant to complete its seismic design within the scope of certified design. Suitability of a future site would then have to be established by demonstrating that the seismic demand spectra for the site are lower than the capacity spectra. As with other design acceptance criteria, the result will be non-standard seismic design for certain systems (e.g., piping).

There are three options for Westinghouse to consider for resolving this issue:

- a. Westinghouse AP600 could adopt the design site specific response spectrum (DSSRS) approach used for the System 80+ reactor design. The suitability of a future site would then be established through a simple comparison of DSSRS and the site specific response spectrum.
- b. The standard safety analysis report (SSAR) could state that the AP600 is not designed for shallow soil sites, i.e., the approved site parameter excludes shallow soil sites.
- c. The SSAR could specify a separate design parameter for shallow soil sites and evaluate the design against that parameter, e.g., 0.2g with Regulatory Guide (RG) 1.60 design response spectra.

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## 2. Design of the Containment Foundation Basemat

The issue of the existence of collocated hard and soft spots in soil has not surfaced for other standard designs because it had no safety impact on their foundation design. Currently, the thinness of the AP600 basemat, even with the consideration of additional shear reinforcement, make it unacceptable for the likely soil stiffness variability that can be reasonably expected to exist at a site. Additionally, considering the basemat design as a COL action item is not acceptable.

There are two options for Westinghouse to consider for resolving this issue:

- a. Demonstrate that the final foundation basemat design can accommodate the effects of soil stiffness variations of hard and soft spots underneath the basemat.
- b. Use different basemat thicknesses for a foundation with uniform foundation stiffness (such as rock sites) and for a foundation with non-uniform soil stiffness (such as soil sites with hard and soft spots). Submit the completed design of each basemat thickness for the staff review and approval.

## 3. Application of Leak-Before-Break (LBB) to Feedwater Lines

Since the potential for water hammer cannot be ruled out, and Westinghouse has not provided a quantitative analysis demonstrating an extremely low probability of this event, the staff has concluded that the criteria in general design criteria-4 (GDC-4), i.e. the probability of pipe rupture due to water hammer is extremely low, has not been met. The staff concludes that application of LBB to the feedwater line for the AP600 is unacceptable.

If you have any questions regarding this matter, you can contact Diane Jackson at (301) 415-8548.

Sincerely,

original signed by:

Theodore R. Quay, Director  
Standardization Project Directorate  
Division of Reactor Program Management  
Office of Nuclear Reactor Regulation

Docket No. 52-003

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