



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

SAFETY EVALUATION BY THE OFFICE OF SPECIAL PROJECTS

TENNESSEE VALLEY AUTHORITY

BROWNS FERRY NUCLEAR PLANT, UNITS 1 AND 2

DOCKET NOS. 50-259, 50-260 AND 50-296

I. INTRODUCTION

As specified in the Browns Ferry Final Safety Analysis Report (FSAR), the Tennessee Valley Authority (TVA) used the record of the El Centro earthquake, N-S component, normalized to OBE and SSE levels, i.e., 0.1g and 0.2g, for the structural analyses and generation of the amplified response spectra of Browns Ferry Nuclear Plant (BFN) facilities. The use of the El Centro N-S record to envelope the FSAR design ground response spectra (Housner Spectra) for both OBE and SSE is relatively conservative. TVA has proposed in its letter dated May 26, 1987, the use of the artificial ground motion time histories that envelope the FSAR ground spectra for the development of floor response spectra for the reevaluation of the safety related structures, systems and components.

II. EVALUATION

By the letter dated May 26, 1987, TVA presented its proposal and justification of using the artificial ground motion time history as an alternate seismic input for the seismic system analyses. Specifically, this time history will be used to generate the amplified floor response spectra which will then be used as input for seismic analysis of the subsystems (piping and equipment). According to the NRC Standard Review Plan (SRP), Section 3.7.1, the use of artificial ground motion time history for seismic analyses is acceptable to the staff, if the response spectra obtained from this time history satisfy the enveloping criteria; i.e., the response spectra obtained should envelop the smoothed design ground response spectra for all damping values to be used in the analyses (analyses of structures, systems and components). However, the artificial time history developed by TVA, as proposed, satisfied the enveloping criteria for the five-percent damped response spectrum only. In other words, the response spectrum obtained from the artificial time history developed by TVA only envelopes the BFN DBE five-percent damped design response spectrum. TVA's basis for not satisfying enveloping criteria for the other damping values is that the use of the time history will be restricted to analysis of systems located within the time history will be restricted to analysis of systems located within "five-percent damping structures," such as the reactor building as specified in the FSAR. TVA interprets the enveloping criteria (i.e., the response spectra obtained from the artificial time history should envelop the smoothed design response spectra for all damping values to be used in the analysis of structures, systems and components) to mean the sampling values for all structures involved in the analysis. By restricting the use of the time history to systems within five-percent damping structures, TVA

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believed that the artificial time history developed for Browns Ferry complied with the SRP 3.7.1 requirement that the response spectra obtained from the time history envelope the design response spectra "for all damping values actually to be used in the analysis." This is not acceptable to the staff for the following reasons:

1. TVA misinterpreted the SRP 3.7.1.
2. The use of the artificial time history developed by TVA (to satisfy the enveloping criteria only for the five-percent damped design response spectrum) could result in unconservative analyses and design of piping and equipment, especially for those piping and equipment located close to the ground.
3. Based on theory and past experience, amplified floor response spectra in the structures, even at high elevations, generated from a time history that satisfies only the criteria for five-percent damping value are less conservative than those that envelop all damping values.

III. CONCLUSION

The staff agrees with the use of artificial ground motion time histories (horizontal and vertical components of earthquake) for the reevaluation of the safety related structures, systems and components at BFN. However, TVA's proposal to satisfy the enveloping criteria only for the five-percent damped design ground response spectrum is not acceptable. TVA should generate the artificial time histories for which the response spectra obtained from these time histories have to envelop the design ground response spectra for all damping values to be used in the analyses of structures, systems and components as required in SRP 3.7.1. This requirement is consistent with NRC's position taken in licensing and operating reactor reviews and the position taken as part of the SEP plants reviewed.

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