



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
WASHINGTON, D. C. 20555

September 6, 1983

Honorable Victor Gilinsky  
Commissioner  
U. S. Nuclear Regulatory Commission  
Washington, DC 20555

Dear Commissioner Gilinsky:

In your letter of July 8, 1983 you asked the ACRS whether the "tau effect" has a sufficiently sound scientific or engineering basis to justify its use to reduce seismic design standards that apply to nuclear power plants and whether the NRC should do further research on this question. In our review of the matter during the 281st ACRS meeting, August 31-September 1, 1983, we had the benefit of written reports from our consultants and from the NRC Staff (References 1-3) and of discussions with representatives of the NRC Staff.

The term "tau effect" was used in a report prepared by Dr. Nathan Newmark for the NRC Staff during the Diablo Canyon operating license review and symbolizes the time required for seismic waves having a horizontally propagating component to traverse the length of the foundation. The longer this "transit" time, the greater the foundation-averaging of this component of the seismic waves. Foundation-averaging can also occur because of randomization of some of the waves due to the effects of inhomogeneities. However, the "tau effect" is only one aspect of the overall kinematic-interaction effects that result from the kinematic restraints on ground motion imposed by a sufficiently rigid and extended foundation. For example, wave averaging is likely to be accompanied by increased rocking and torsional response.

We believe that, in general, there do not currently exist sufficient experimental data and adequate theoretical analysis to justify specific consideration of the "tau effect" routinely in the review of the seismic design of nuclear power plants. However, we would not rule out consideration of kinematic effects resulting from random spatial variations of ground motion in an assessment of seismic design margins when adequate ground motion and foundation/structural response models are used and when adequate data are available from sufficiently similar sites.

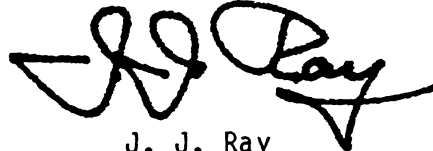
Honorable Victor Gilinsky

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We believe that the general area of soil-structure interaction warrants further research but would not single out the "tau effect" for specific emphasis.

Sincerely,

A handwritten signature in black ink, appearing to read "J. J. Ray". The signature is stylized with large, sweeping loops and a long horizontal stroke at the end.

J. J. Ray  
Chairman

References:

1. Letter from D. L. Bernreuter and James J. Johnson, Lawrence Livermore National Laboratory, to Dr. David Okrent, ACRS, Subject: LLNL Response to ACRS Questions on the Tau Effect, dated August 18, 1983
2. Letter from J. Enrique Luco, ACRS consultant, to Dr. R. Savio, ACRS, dated August 24, 1983 enclosing the subject report, "Comments on the Use of Kinematic Interaction Effects (Tau Effect) in Establishing Seismic Design Criteria"
3. Memo from W. J. Dircks, EDO, NRC, for Raymond F. Fraley, ACRS, Subject: ACRS Request for Staff Comments on the Use of the Tau Effect, dated August 30, 1983