



December 23, 1983

Mr. B. K. Singh
Mail Stop P-1022
Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Singh:

Subject: Evaluation of Supplemental Information Pertaining to Probabilistic Risk Assessment (PRA) for Tornado and Hurricane Missile Hazard to the Containment Isolation Valve Compartment Equipment, South Texas Project

The report "Technical Evaluation of Probabilistic Risk Assessment for Tornado and Hurricane Missile Hazard to the Containment Isolation Valve Compartment Equipment, South Texas Project," was based on documents made available to the National Bureau of Standards before December 12, 1983. Following that date, I have received from NRC: (1) a copy of questions addressed by NRC to Bechtel concerning the subject PRA, and of responses from Bechtel to these questions (attached herewith), and (2) a copy of NRC memorandum Docket Nos. 50-498/499 dated December 13, 1983, to George W. Knighton and Olan D. Parr from William P. Gammill, all of NRC, on the Meteorology Review of Probabilistic Evaluation of Isolation Valve Cubicled Roof Design for South Texas.

NRC Questions to Bechtel

In my opinion, given the present state of the art, Bechtel's responses to the NRC questions satisfactorily answer concerns that may be raised with respect to:

1. the missile surface density assumed in the Bechtel South Texas Study
2. the possibility that missiles lighter than those assumed in the Bechtel South Texas Study might be available and damage the Isolation Valve Compartment, and
3. the possibility that Bechtel's estimates of injection probability may be somewhat low. In the event that the threshold hurricane wind speed for missile injection is reduced to 165 mph, the median probability of hitting the target will increase by about one order of magnitude if 10 percent of the missiles are unrestrained and by about two orders of magnitude if all missiles are unrestrained.

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NRC Meteorology Review

With respect to the NRC Meteorology Review, I note that most of the difference between the NRC and the Bechtel estimate of probability that a tornado strikes the site in any one year (1.7×10^{-4} per year and 1.17×10^{-5} per year), is due to the difference between the respective estimates of the mean tornado path area (0.206 square miles by NRC; about 0.049 square miles, to which there corresponds a median of 0.022 square miles, by Bechtel).

The NRC mean tornado path area was estimated from a sample of 250 tornadoes (period of occurrence 1954 - 1981) reported in the two-degree latitude-longitude square (excluding overwater area) containing the plant site. On the other hand, the Bechtel estimate was based on a sample of 2,730 tornadoes reported in 1953 - 1982 throughout the state of Texas. I believe that tornadoes in south Texas and in the other areas of Texas do indeed not constitute a meteorologically homogeneous set and, therefore, that the NRC estimate is more credible. This would increase the rate of occurrence of tornadoes at the site and, hence, the nominal probability of damage to IVC from tornado-generated missiles by about one order of magnitude. Thus, the estimated median of probability of damage to IVC from tornado-generated missiles would be about 3×10^{-9} , rather than 2×10^{-10} as indicated in the Bechtel study.

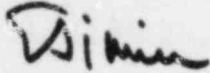
The NRC memorandum mentioned above notes that the Bechtel estimate of hurricane wind speeds appears reasonable. This is also my view. Thus, the NRC memorandum would not entail a modification of the estimated median value of the nominal probability of damage to IVC by hurricane-borne missiles put forth by Bechtel (i.e., 1.2×10^{-10} per year). However, the NRC memorandum points out that winds other than hurricanes and tornadoes were not considered in the Bechtel study.

Calculations conducted at NBS and reported in "Hurricane Wind Speeds in the United States" by M.E. Batts, et al. (Journal of the Structural Division, ASCE, October 1980, pp. 2001-2016) indicate that the effect of nonhurricane and nontornado winds on the probability of occurrence of winds of any given speed is perceptible only for speeds corresponding to mean recurrence intervals of about 25 to 50 years at most. Therefore, it is my opinion that failure to consider winds other than hurricanes and tornadoes does not affect the calculations of the Bechtel study.

The estimated median value of the nominal probability of damage to the IVC by tornado or hurricane-borne missiles would then be about $3 \times 10^{-9} + 2 \times 10^{-10} \approx 3 \times 10^{-9}$. Given the various uncertainties inherent in the Bechtel estimates (including uncertainties with respect to the probability of injection as reflected in the Bechtel answer to question #3 by NRC), it is

my opinion that the estimated probability of damage to the IVC of 3×10^{-9} is correct to within one or two orders of magnitude.

Sincerely,



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cc: S. Boyd
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