03/16/81

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING APPEAL BOARD

In the Matter of	)	
	)	
PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE, ET AL.	)	Docket No. 50-443 50-444
	)	
(Seabrook Station, Units 1 and 2)	)	

REBUTTAL TESTIMONY OF LEON REITER, Ph.D. TO
THE FILED DIRECT TESTIMONY OF DR. MICHAEL CHINNERY

Q.1. Dr. Reiter, have you reviewed the "Statement Of Dr. Michael Chinnery On Remand To The Atomic Safety And Licensing Appeal Board Submitted By The New England Coalition On Nuclear Pollution."

A.1. Yes.

Q.2. Dr. Chinnery has indicated in his filed direct testimony (p. 1) that there are two methodologies, "Deterministic" and "Probabilistic" for estimation of the SSE. What comments do you have with respect to Dr. Chinnery's description of the "probabilistic" approach?

A.2. Dr. Chinnery has taken a narrow view of the probabilistic approach. He restricts it to defining the SSE intensity associated with a given province. It is more appropriate to conduct such evaluations with respect to ground motion at a particular site. Sites located in tectonic provinces with equivalent 100, 1,000 or 10,000 year earthquakes may be characterized by earthquake hazard (risk) differing by several orders of magnitude depending upon whether the size of the province is of the order of 1,000 or 100,000 sq. kilometers. Dr. Chinnery's comparison (p. 10) of his estimate of

annual risks of $10^{-2.5}$ for Intensity VIII and 10^{-3} for Intensity IX in the Boston New Hampshire Zone with the "10^{-3} to 10^{-4} per year . . . mentioned the past" is inappropriate. Clearly if these numbers were those mentioned by the Staff (see for example Jackson, 1980, and the Sequoyah SER) then they referred to hazard or risk at the site which is much less than that associated with the whole province estimate mentioned by Dr. Chinnery.

Q.3. How valid is Dr. Chinnery's opinion (p. 13) that with respect to seismological information gathered by the TERA Corp. (1979) ". . . the only valid conservative interpretation of this set of opinions is that we should admit the possibility of an intensity X earthquake in the Boston-New Hampshire seismic zone, until convincing scientific evidence arises that will persuade us to revise this value?"

A.3. It is our position that a conservative and more appropriate way to interpret the estimates of the largest earthquake to be expected to occur in Cape Ann, Massachusetts Region is to use such estimates in the context of the way such estimates were presented in the TERA study and in the context of the way such estimates were intended to be used in that study. Namely, to place greatest weight on each expert's best estimate and least weight upon the low and high estimates and then use these distributions in conjunction with other parameters (e.g., "b" values, zone configuration) stipulated by each expert in arriving at return periods for ground motion. This was done for the sites in the Systematic Evaluation Program (Jackson, 1980) and is presently being calculated for the Seabrook site by Lawrence Livermore Laboratories. Initial results of these calculations were presented

in Staff testimony (Figure 1 to "Testimony of Leon Reiter, Ph.D.") and, as stated in that testimony, a final report from Lawrence Livermore Laboratories will be submitted to all parties as soon as it is available.

We do not think that Dr. Chinnery's use of the TERA study in his testimony (p. 13) is appropriate. What Dr. Chinnery has done is to (1) assume that the higher half (X or greater) or the "high estimates" represents the only estimate, (2) extrapolate linearly to that range without any regard for the uncertainties and distributions indicated by the polled experts, and (3) and then use these extrapolations without any consideration for the other steps in estimating ground motion at a site.

Q.4. Do you agree with Dr. Chinnery's assessment (p. 2) of the instrumental record in general and the recent seismic network in particular that it "can contribute little to the assessment of seismic risk in the area?"

A.4. No - we think instrumental seismicity can have significant effects upon the assessment of seismic risk in New England. Examples of this include the observation (also made by Dr. Chinnery on p. 4) that the recent instrumental data show low seismicity around Cape Ann and do not define a fault or other source zone, and the use of instrumental data and present intensity data to derive estimates of magnitude from historical data (see for example Street and LaCroix, 1979). Aside from affecting recurrence intervals these observations form part of the general seismological and geologic considerations that must accompany any application of numerical probabilistic calculations at the site.

Q.5. How do you assess Dr. Chinnery's statement (p. 11) that for the Boston New Hampshire Seismic Zone" we can use the most reliable data points (for Intensity V & VI) to define the frequency Intensity Relationship.

A.5. We think it is highly inappropriate to estimate return periods for high intensity earthquakes beyond the historical record upon two data points at low intensities. For example, if we followed this approach and utilized the data set presented by Mr. Holt in his filed direct testimony (p. 17) we would find that the b value defined by these two points was approximately 0.85 rather than 0.57 and that the return periods for Intensities VIII, IX and X were of the order of 2200 and 16,000 and 111,000 years rather than the significantly lower values of 371, 1445 and 5623 years proposed by Dr. Chinnery (Chinnery, 1979, p. 769).

Q.6. Do you agree with Dr. Chinnery's statement that his study (Dr. Chinnery's testimony p. 11) was the only study that addressed variation of slopes (b values) for the frequency Intensity relationship from region to region?

A.6. No. Other studies enumerated in my filed direct testimony such as Algermissen and Perkins (1976), Yegian (1979) and TERA (1980) have reported on variation of b values from region to region. There are many other studies which discuss related variations in the frequency-magnitude relation from region to region. See "Testimony of Leon Reiter, Ph.D." Q.5, pp. 5-6.