

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)	
Dairyland Power Cooperative)	Docket No. 50-409
(LaCrosse Boiling Water Reactor)	(FTOL Proceeding)

AFFIDAVIT OF LEON REITER AND JEFFREY KIMBALL
IN RESPONSE TO BOARD QUESTIONS

I, Leon Reiter, being duly sworn, state as follows: I am employed as the Leader of the Seismology Section in the Geosciences Branch of the Division of Engineering, Office of Nuclear Reactor Regulation. A copy of my professional qualifications is attached.

I, Jeffrey K. Kimball, being duly sworn, state as follows: I am employed as a Seismologist/Geophysicist in the Geosciences Branch of the Division of Engineering, Office of Nuclear Reactor Regulation. A copy of my professional qualifications is attached.

In the July 2, 1982 Atomic Safety and Licensing Board Memorandum concerning the LaCrosse Boiling Water Reactor (Docket No. 50-409), the Board raised a number of questions concerning an affidavit filed by the NRC staff on January 28, 1982. The affidavit contains five attachments, one of which (attachment 3, Memorandum to D. Crutchfield from Robert Jackson dated June 23, 1980 entitled, "Initial Review and Recommendation for Site Specific Spectra at SEP Sites") has raised specific questions by the Board. These questions are listed below along with a response in question and answer form. References are attached.

Question 1

"We refer in particular to the deterministic study reported on pages 14-16 of the enclosure to Attachment 3, including Tables 1 and 2. First, there is no indication in the record of who did this study nor of the staff's views as to its acceptability." (Page 2, lines 7-10.)

Response

The study (the calculations and the writing of the enclosure to Attachment 3) was completed by Dr. Leon Reiter of the NRC staff. This study was completed to further evaluate the adequacy and reasonableness of the recommended SEP design spectra. Specific comments regarding Tables 1 and 2 are answered in subsequent questions. In general the difference between the deterministic and probabilistic values result from the ability of the uniform hazard approach to overcome the artificial constraints often posed by the "tectonic province" approach. For the LaCrosse site, the probabilistic peak acceleration is less than the deterministic peak acceleration because LaCrosse is in an area of low seismicity and estimated seismic hazard in the central United States.

Question 2

"Throughout these proceedings, the Staff has consistently held that a magnitude 5.0-5.5 or intensity VII earthquake is appropriate for LaCrosse and that this earthquake corresponds to a peak acceleration of 0.12g. Yet Table 1 shows for the five reactors in the central U.S. a magnitude 5.3 earthquake but an intensity VII-VIII. Why?" (Page 2, lines 10-15.)

Response

The earthquakes listed in Table 1 are based upon the largest historic intensity earthquakes which have not been associated with a known structure within the host tectonic province. This Table was developed for comparison with the recommended SEP design spectra. For

LaCrosse this earthquake would be (assuming central stable region province) the 1937 MMI=VII-VIII Anna, Ohio event for which both available instrumental data and felt area estimates indicate a magnitude of 5.0 to 5.3. In general, however, based upon many central United States earthquakes Nuttli (1974) and Nuttli and Herrmann (1978) have found that an epicentral intensity VII is about a magnitude 5.3 (Intensity = $2X$ magnitude - 3.5). The staff position during the hearings has been based upon this generalized relationship.

Question 3

"More seriously, Table 2 gives the result for LaCrosse as .135g which is higher than the 0.12g for which potential liquefaction at LaCrosse has thus far been evaluated." (Page 2, lines 15-17.)

Response

As stated in response 1 these values (Table 2) were completed to help the staff evaluate the adequacy and reasonableness of the recommended SEP design spectra. They were not intended to replace the SEP spectra. For LaCrosse, the probabilistic acceleration is slightly less than either deterministic peak acceleration (0.12g or 0.135g) because this site is in an area of low seismicity and estimated seismic hazard in the central United States. The value 0.12g was originally proposed by the applicant in 1973, and in the review related to the show cause order (1980) it was determined that this peak acceleration roughly correlated with intensity VII based upon Trifunac and Brady (1975). Trifunac and Brady (1975) is the relationship most often used for reviews by the staff in the past seven years. 132 cm/sec^2 (0.135g) was determined using both state of the art relationships and those developed

specifically for the SEP study by LLNL. In any case, differences on the order of 0.01g are not significant and are certainly lost within the scatter of estimation techniques.

Question 4

"Moreover, Attachment 1 states that the Anna, Ohio earthquake of 1937 is classed as intensity VII-VIII and that the vibratory ground acceleration corresponding to MM intensity VII-VIII is 0.20g." (Page 2, lines 18-20.)

Response

Intensity VII-VIII corresponds to about 0.20g using the relationship of Trifunac and Brady (1975), and was the technique used by the staff in Attachment 1. This relationship relies only upon intensity. Trifunac and Brady (1975) was not used to calculate the values in Table 2. The relationships used and referred to in the response to Question 3, placed greater emphasis on the magnitude of the Anna, Ohio earthquake. Magnitude is a more reliable estimate of earthquake source strength than epicentral intensity. See also response to Question 5.

Question 5

"Of lesser significance, Table 1 appears to equate magnitude 5.3 to intensity VII for four reactors and to intensity VII-VIII for the others. Why?" (Page 2, lines 20-22.)

Response

As stated in response 2 the earthquakes listed in Table 1 are based upon the largest historic intensity earthquakes which have not been associated with a known structure within the host tectonic province. For the Central United States sites this is intensity VII-VIII which has an

estimated $m_b = 5.3$ based upon felt areas and available instrumental data while for the Eastern United States sites this is intensity VII which has an estimated $m_b = 5.3$ based upon epicentral intensity. Estimated magnitudes based upon felt area are more accurate than those based upon general correlations with epicentral intensity. Estimated magnitudes based upon felt area have not been completed for all eastern United States earthquake as of yet.

Question 6

"Is the solid line labeled Western U.S. Trifunac and Brady on 5-2, page C-48, NUREG/CR-1582, Vol. 4, the intensity-acceleration used in this deterministic study? If so how does one read a peak acceleration of 0.135g for an earthquake of intensity MM VII-VIII?" (Page 2, lines 22-26.)

Response

Trifunac and Brady (1975) was not used to determine values in Table 2. The suites of equations used are referred to at the base of Table 2.

Question 7

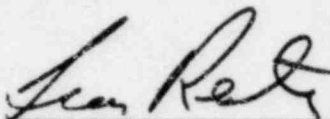
"Finally, what is the staff's basis for rejecting Dr. Nuttli's view that 'For nowhere in the central United States, would I estimate the PGA (peak acceleration) to be less than 160 cm/sec²' (page A-10, Vol. 5, NUREG/CR-1582)?" (Page 2, line 26; page 3 lines 1-3.)

Response

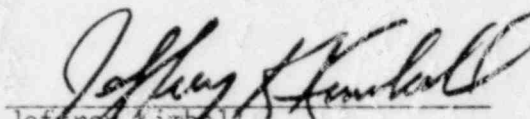
Dr. Nuttli goes on to state (Page A-11, Vol. 5, NUREG/CR-1582) that "I do not wish to imply that my 'deterministic' estimates are the proper ones and that the UHM values which differ from them are incorrect. It may well be that the UHM values are better." Dr. Nuttli was involved in

many aspects of this project (seismic source panel, attenuation panel and peer review panel.) In addition, the staff regularly is in contact with Dr. Nuttli regarding his views and ideas on seismicity and ground motion. The staff SEP decision is based upon a total integration of all available information from many experts. It does not rely on any one individual whether they be higher or lower than the recommended SEP spectra.

I hereby attest that the foregoing affidavit is true and correct to the best of my knowledge.

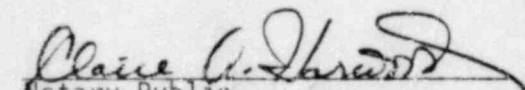


Leon Reiter



Jeffrey Kimball

Subscribed and sworn to before me
this 12th day of August 1982



Notary Public

My commission expires: July 1, 1986

REFERENCES

- Nuttli, O.W., 1974, Magnitude-Recurrence Relation for Central Mississippi Valley Earthquakes, Seismol. Soc. Amer. Bull., 64, 1189.
- Nuttli, O.W. and R.B. Herrmann, 1978, Credible Earthquakes for the Central United States, State-of-the-Art for Assessing Earthquake Hazards in the United States, U.S. Army Engineer Waterways Experiment Station, Report 12.
- Trifunac, M.D. and A.G. Brady, 1975, On the Correlation of Seismic Intensity Scales with Peaks of Recorded Strong Ground Motion, Seismol. Soc. Amer. Bull., 65, 139.