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

OCT 25 1979

MEMORANDUM FOR: D. Crutchfield, Chief, DOR
Systematic Evaluation Program Branch

FROM: Robert E. Jackson, Chief
Geosciences Branch, DSS

SUBJECT: ASSESSMENT OF LIQUEFACTION POTENTIAL
FOR THE LACROSSE NUCLEAR POWER STATION

REFERENCES: (1) Memorandum for Victor Stello, Director, Div. of Operating Reactors, NRR from R. P. Denise AD for Site Technology, Same Subject dated Jan. 11, 1979

(2) Memorandum for Don Davis, Chief, SEP, DOR from J. Carl Stepp, Same Subject dated Dec. 22, 1978

We and our consultant, the U. S. Army Corps of Engineers Waterways Experiment Station (WES) have completed our review efforts of the applicants' thorough investigation of the liquefaction potential at the LACBWR site. The reviewed report is entitled "Liquefaction Potential at LaCrosse Boiling Water Reactor (LACBWR) Site near Genoa, Vernon County, Wisconsin" by Dames and Moore dated August 10, 1979.

Based on review of this report, we can conclude that if sustained strong ground motion with peak accelerations of .12g or higher occurs (normally associated with a magnitude 5 or greater earthquake) liquefaction can occur down to a depth of 40 feet. Below .08g, we can conclude that there is little potential for liquefaction. These conclusions are based on our comparison of this site with other sites where liquefaction has occurred and on the use of laboratory strength data as discussed by John Greeves, a staff geotechnical engineer and Dr. William Marcuson, a WES geotechnical engineer, at a meeting with the licensee on October 16, 1979. WES has provided a letter (attached) dated October 19, 1979 which further defines the basis for this conclusion. In summary, based on judgement concerning the density and strength data and on empirical correlations WES concludes that the foundation material below the water table down to a depth of 40 feet is not safe against liquefaction if the licensee designated safe shutdown earthquake with a peak acceleration of 0.12g occurs.

In our opinion, the more recent investigations, report dated August 10, 1979, undertaken by the licensee's consultant Dames and Moore, Inc. confirms the previous conclusion that the soils at the LaCrosse site could strain badly for an earthquake producing a surface level peak acceleration of 0.12g as noted by WES in "Liquefaction Analysis for LaCrosse Nuclear Power Station," Paper GL-79-11, dated June, 1979.

We have made an initial estimate of the probability of exceeding a range of peak accelerations at the LaCrosse site in order to make an estimate of the hazard associated with the liquefaction potential. In doing so, we utilized all readily available estimates of earthquake probability that included the site region. These were estimates taken from Milne and Davenport (1969), Algermissen and Perkins (1976), the Applied Technology Council (1978), the Haven Site Preliminary Safety Analysis Report (1978), and preliminary results from the Systematic Evaluation Program (SEP) probabilistic study of the LaCrosse site.

The Safe Shutdown Earthquake (SSE) free field ground motion designated by the licensee in the Full Term License application is .12g anchored to a Regulatory Guide 1.60 spectrum. Based on our review of probabilistic studies listed above, the return period for .12g would be at least 1,000 years. This peak acceleration (.12g) is equivalent to Intensity VII when utilizing the relationship of Trifunac and Brady (1975). The return period for .08g would be at least 400 years. These values are based upon the minimum return period calculated in the above studies. While these values should not be interpreted as absolute minimums, the actual return period could be an order of magnitude larger. As mentioned above, these estimates are preliminary and only serve to indicate the general level of seismic hazard at the site.

As part of the SEP program, we are currently reevaluating the SSE seismic design at LaCrosse. Based upon limited consideration of current Standard Review Plan procedures, the LaCrosse site lies in an area of low seismicity in the Central Stable Region Tectonic Province. The highest intensity near the site historically was estimated to be Intensity V due to the 1811-1812 New Madrid earthquakes, 800 kilometers from the LaCrosse site. The 1909 Beloit earthquake on the Wisconsin-Illinois border probably produced intensity II to IV at the site. The site is not located near any known localizers of seismicity. Based on a recent staff decision for a proposed construction permit application, the SSE intensity could be VII or VII-VIII for the general region including the LaCrosse site. Using the Trifunac and Brady (1975) relationship, the free field ground motion corresponding to intensity VII would be .13g and intensity VII-VIII would be .20g, which would be used as the high frequency anchor to the Regulatory Guide 1.60 response spectrum.

We can conclude based on our evaluations to date that there is a relatively low seismic hazard at this site because of the earthquake history and initial estimates of the long return periods in this region for the size event that would have to occur to generate .12g. We do note however, that our current evaluations indicates that there is concern in the event that ground motion at the .12g level were to occur. We conclude that there is a low seismic hazard for this facility during the period required to complete our evaluation of the SEP seismic methodology and establish the seismic design bases for LaCrosse. It will take approximately three months to establish this value.

Robert E. Jackson

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Attachment:
As stated

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