

## Mid-America Coalition For Energy Alternatives

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June 29, 1979

Joseph Hendrie, Chairman  
Peter Bradford, Commissioner  
Victor Gilinsky, Commissioner  
Richard Kennedy, Commissioner  
John Aherne, Commissioner  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

Dear Commissioners:

I wrote you on January 19, 1979, on behalf of my client asking that you suspend the construction permit for the Wolf Creek project in view of documented quality control problems specifically related to the base mat of the reactor containment building. You responded by publishing a notice of our request in the Federal Register.

This letter is to advise of certain new determinations with respect to the seismic character of the area and to renew our request for at least a partial suspension of the construction permit in view of the significance of those determinations in conjunction with existing unresolved issues regarding base mat integrity.

Your attention is directed to a report of the Kansas State Geological Survey (KSGS) prepared under contract to your Division of Reactor Safety Research, Office of Nuclear Regulatory Research, entitled "A Revised and Augmented List of Earthquake Intensities for Kansas, 1867-1977" NUREG/CR-0294, August, 1978. The report details the conclusion of the KSGS that the largest historical earthquake in Kansas occurred at a different location and was of a different magnitude than had been previously believed. This earthquake was used as the basis for the design of the non-standardized Category I (safety related) portions of the plant. Commonly known as the 1867 Manhattan earthquake and thought to have been of the size Modified Mercalli VII, its epicenter was assumed to have been approximately 22 miles northwest of Manhattan, Kansas. The applicants argued that the earthquake was related to a presumed "zone of weakness" associated with the contact of the Keweenaw mafic volcanic belt and the Nemaha Ridge (Nemaha Uplift). The nearest

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approach of the zone, according to the SNUPPS PSAR Wolf Creek Addendum, is 75 miles from the Wolf Creek site. On that basis the applicants urged the adoption of a safe shutdown earthquake (SSE) with a .10g horizontal acceleration.

Finding insufficient basis for the applicants' assumption that the earthquake was related to such a zone of weakness, your staff apparently insisted that the SSE be based on the assumption that the 1967 Manhattan earthquake could occur on the Nemaha Ridge at its closest approach to the Wolf Creek site, 50 miles. Such an assumption would, concluded the staff, yield a safe shutdown earthquake of .12g, and the site was licensed accordingly.

In light of the new information developed by the KSGS concerning the size of the 1867 earthquake and the actual location of its epicenter, and recent microseismicity recorded along the long inactive Humbolt Fault, the postulated .12g horizontal acceleration safe shutdown earthquake does not now appear to be conservative. The KSGS report concludes, on the basis of extensive review of historical records, that the 1867 "Manhattan" earthquake was at least a Modified Mercalli VII-VIII -- stronger than the MM VII that both applicants and staff had assumed. It concluded also that its epicenter was in the Wamego vicinity, and was, accordingly, associated with the Humbolt Fault. The Humbolt Fault defines the eastern boundary of the Nemaha Ridge and passes within 50 miles of the Wolf Creek site. In addition, since January, 1978, numerous microearthquakes have occurred along the trace of the Humbolt Fault north of the Wolf Creek site and south in Oklahoma. While the KSGS has not yet concluded that this means stress is building in the vicinity of the nearest approach of the fault to the plant site, they site successful earthquake prediction experience elsewhere in the country which indicates that such is often the case.

The size of the appropriate safe shutdown earthquake for the Wolf Creek site can be determined by reference to your staff's Safety Evaluation Report for another of the SNUPPS units, Tyrone. Both Tyrone, in Wisconsin, and Wolf Creek are located in the Central Stable Region Tectonic Province. The following Tyrone SER discussion elucidates the reason for setting the Tyrone SSE at .2g horizontal acceleration:

"Based on historical accounts, the area of the Central Stable Region in which the Tyrone site is located is seismically very quiet. No historical earthquakes have been reported within 100 miles of the site, and only ten earthquakes of intensity MM IV or greater have been reported within 200 miles of the site. The nearest historical earthquake in the vicinity of the Tyrone site, which occurred sometime between 1865 and 1870, had an estimated

intensity MM VI-VII and occurred slightly more than 100 miles west of the site.

\* \* \*

"The Midcontinent Geophysical Anomaly is located approximately 45 miles northwest of the Tyrone site. This feature corresponds to a region characterized by gravity and magnetic anomalies, which over much of its extent, coincide with mapped basement faulting. The Midcontinent Geophysical Anomaly extends generally from the Lake Superior region south-west through Minnesota, across Iowa, and into Kansas where it trends into the Nemaha Uplift. The largest historical earthquakes which have been located along this feature have had reported epicentral intensities of MM VIII. However, as has been noted above, the characteristics associated with at least one of these intensity MM VIII events, the Keewenaw Peninsula earthquake of 1906, would indicate that the intensity level may have been influenced by local geology. If it is assumed that an intensity MM VIII earthquake could occur on structures associated with the Midcontinent Geophysical Anomaly at its closest approach to the site; i.e. 45 miles, the intensity at the site due to attenuation would be reduced to intensity MM VII-VIII.

\* \* \*

"In 1954 Neumann developed an empirical relationship between earthquake intensity and ground acceleration. More recently Trifunac and Brady (1975) have published a relation between intensity and acceleration which was developed using many additional observations. Trifunac and Brady's data essentially corroborate the relationship published by Neumann. Utilizing either the Neumann or the Trifunac-Brady relation between intensity and acceleration, the mean acceleration corresponding to intensity MM VII-VIII is 0.2g. Based on this analysis we consider 0.2g to be the appropriate acceleration for the seismic design of the proposed plant at the Tyrone site." pp. 2-16, 17, 18

With respect to the base mat of the Wolf Creek reactor building, the significance of setting the safe shutdown earthquake at .2g horizontal acceleration is substantial. Your staff has been unable to conclude that the 90-day concrete cylinder tests, which showed that the base mat concrete failed to meet the design specification of 5000 pounds per square inch, were in error. Accordingly, it ordered the applicants, who carry the burden of proof on all

such matters, to show that the concrete is of sufficient strength, on the basis that the 90-day tests are assumed to be accurate. The Wolf Creek architect/engineer, the Bechtel Power Corporation, performed the reanalysis by first determining that actual concrete strength as shown by the 90-day tests was 4460 pounds per square inch (by working backward from the acceptance criteria) and then by performing computer simulations to show that the base mat was adequate at that strength to permit the safe shutdown of the plant even if it is subjected to a horizontal acceleration of .2g -- greater than the .12g earthquake for which, as noted above, the Wolf Creek site is licensed.

The standardized portion of all SNUPPS plants must be built to be shut down safely after a .2g earthquake. The Bechtel Report notes that this safe shutdown earthquake is "controlled by a site other than Wolf Creek", but does not specify which one. The Report states that the use in the reanalysis of the greater than required .2g assumption "is consistent with the general methodology used for the project, is in accordance with the commitments made in PSAR Section 3.7 and provides additional conservatism." "Seismic loads were conservatively determined at the SNUPPS envelope "g" level, which is considerably higher than that for which the site is licensed", states the Report in its conclusion. We submit that the reanalysis was, for the reasons discussed above, not conservative -- that the Bechtel Report shows, if it is valid, only that the base mat is not expected to crack during the largest probable earthquake, if the concrete undergoes no deterioration.

However, no allowance is made in the Bechtel Report for normal deterioration of the base mat due to routine plant operation. In addition, evidence exists that the base mat concrete is presently undergoing spontaneous deterioration due to some as yet unknown cause.

As you are aware, some of the 90-day test results were lower than the 28-day test results. Unless the reason for this anomaly is explained, it constitutes evidence that deterioration is taking place -- evidence which, under your agency's rules, it is the responsibility of the applicants to refute. Yet, on June 7, 1979, your staff issued a summary of the public meeting held in Burlington, Kansas on May 15, 1979, to review with the applicants the Bechtel Report and the base mat problem generally, a principal conclusion of which was:

"1. There is no clear cut answer as to why some of the 90-day cylinder test results are lower than 5000 pounds per square inch. Neither is there a clear cut answer as to why some of the 90-day strength results

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are lower than those obtained with the 28-day cylinders."

We understand that your staff has now enlisted the technical services of the U.S. Army Corps of Engineers in an effort to illuminate the deterioration issue, and that several factors and combinations of factors are being investigated.

We are aware of one such possibility, which we communicated to your staff two months ago. It involves the possible presence of opaline in the aggregate portion of the concrete mixture. Opaline has, after numerous investigations, been determined to be responsible for the unusual phenomenon attending concrete made with river sand aggregate taken from northern Kansas rivers, including the Kaw, or Kansas, River; the concrete tends to expand and weaken over time, although this effect is seemingly somewhat unpredictable. It is our understanding that the source of the fine aggregate for the Wolf Creek base mat was originally to have been a limestone quarry near Ottawa, Kansas, operated by the Haworth Company, but that Daniels, the Wolf Creek general contractor, with the assumed knowledge of the applicants, changed the source to Kaw River sand, to be supplied by Holiday Sand and Gravel of Bonner Springs, Kansas. The change precipitated a lawsuit by Holiday, which is pending in Coffey County. We do not know that your staff has addressed this.

Accordingly, we inquire whether the ultimate source of the aggregate was properly approved by your staff and whether the presence of opaline aggregate has been determined and evaluated for its significance to the deterioration issue.

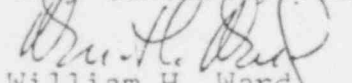
In sum, (1) the largest historical earthquake in Kansas was bigger than your staff and the applicants were aware and took place on a fault which passes 50 miles from the plant site, which is only now known to be active, and which may be developing a "seismic gap" in the vicinity of the nearest approach to the plant, (2) no evidence exists that the base mat could survive such an earthquake after a period of wear and tear due to normal plant operations, or at any time if spontaneous deterioration is taking place, and (3) evidence that such deterioration is taking place exists. It is therefore imperative that those making decisions about the Wolf Creek project know all that can possibly be known about the nature of the concrete in the base mat. We ask that you provide us a complete explanation of all the steps taken by you, other governmental agencies, the applicants or their agents to determine whether deterioration of the base mat can be expected.

Finally, we ask that you take action on our petition of January 19, 1979, concerning the Wolf Creek construction

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permit. It is your staff's position, expressed repeatedly, that the applicants' decision, without staff authorization, to remove the voluntary "hold" placed on construction of the containment building, would cause the staff to seek an immediate order from you, which they expect would be granted, requiring that such work be stopped. In fact, a vice-president of applicant KG&E advised your staff in writing at the time of the May 15, 1979 Burlington meeting that they intended to resume concrete placement in the reactor containment building within a few days. It is our understanding that "javeloning" by your staff dissuaded them. It remains our position that a partial construction permit suspension is the only effective way for your agency to protect the public interest in this situation, and we hereby renew our request that you act accordingly.

Very sincerely yours,

  
William H. Ward  
Attorney for MACEA

WHW:bw

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