



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

OCT 28 1977

*Schwencer*

MEMORANDUM FOR: Karl R. Goller, Assistant Director  
for Operating Reactors, DOR

FROM: William P. Gammill, Assistant Director  
for Site Technology, DSE

SUBJECT: ASSESSMENT OF GEOLOGY AND SEISMOLOGY OF THE  
GENERAL ELECTRIC TEST REACTOR SITE

Enclosed is a report of the status of our review of the geology and seismology of the General Electric Test Reactor Site at Vallecitos, California. A draft and discussion of this report was provided to DOR on October 22 for use in developing the Show Cause Order which was transmitted to General Electric on October 24, 1977.

*W. P. Gammill*

William P. Gammill, Assistant Director  
for Site Technology  
Division of Site Safety and  
Environmental Analysis

Enclosure:  
As stated

cc w/encl:  
E. Case  
V. Stello  
A. Schwencer  
F. Berger  
J. Scinto  
H. Denton  
D. Muller  
J. Stepp  
R. Hofmann  
R. Jackson  
J. Kelleher  
R. Cunningham  
R. Starosteki

7812180 330

ASSESSMENT OF GEOLOGY AND SEISMOLOGY AT THE  
GENERAL ELECTRIC TEST REACTOR SITE  
STATUS OF REVIEW-October 25, 1977

In July 1977, the Division of Operating Reactors requested review of the geology and seismology of the Vallecitos Nuclear Center (VNC) for license renewal of the General Electric Test Reactor (GETR). A brief review of the information available to the staff\* indicated that insufficient information was available on which to base any decision with regard to the seismic and geologic hazard at the site. However, based upon a general knowledge of the tectonics of that region, it was concluded that a potentially serious earthquake hazard existed at the GETR site. The staff's concerns were expressed at a meeting between NRC staff and GE representatives on August 3, 1977.

During the August 3 meeting the staff : additional geological and seismological information would be required. The staff also learned at that meeting of a recently completed U. S. Geological Survey investigation of the region which includes the GETR site.

On August 22, 1977, NRC received an advance copy of the U. S. Geological Survey (USGS) open-file report number 77-689 which contained an interpretation of the geology of Livermore Valley, California. A new geologic map which accompanied the report placed the Verona fault immediately adjacent to the GETR. This fault had previously been mapped approximately 1/2 mile north of the GETR. The NRC staff provided

---

\*July 1973 report by John A. Blume & Associates entitled, "Seismic and Geologic Investigations for the GETR Facility."

the USGS open file report and a discussion of the significance of the Verona fault to the Commission in an Information Paper, SECY 77-481 dated September 13, 1977.

On August 31, 1977, the NRC staff attended a briefing by Dr. Darrell G. Herd, author of the USGS open-file report #77-689. That briefing included the latest information which Dr. Herd had on the Verona fault and a discussion of his bases for postulating the existence of the Verona fault at the location given in the report. The briefing was also attended by representatives of the General Electric Company and their geological consultants. Following the briefing the NRC staff discussed with the licensee its program for investigating the Verona fault and made tentative arrangements to visit the site upon completion of trenching across the trend of the postulated fault trace.

The first trench was available for inspection the week of October 10, 1977. The NRC staff met with Dr. Herd again on October 12 for additional discussions of the postulated fault. Three members of our staff Mr. Renner Hofmann, Dr. Robert Jackson, and Dr. John Kelleher, accompanied by Mr. Robert Morris of the USGS, inspected the trench on October 13, 1977. On completing their inspection, the geologists agreed that the trench, which is 200 feet in length and about 13 ft. in depth, was properly located across the expected trace of the Verona fault. Although direct evidence of faulting could not be observed at that time, it was generally believed that the possibility of thrust faulting could still not be discounted. Thus, the staff requested



that the trench be allowed to dry out, that it be deepened at one end, and that the walls be cleaned up and thoroughly mapped to confirm that there was no evidence of the existence of the fault.

This work, including completion of a second trench across the postulated fault trace, was continued by the licensee and on October 20, Mr. Doug Hoggatt (GE), in a telephone conversation with Mr. A. Schwencer, DOR, reported for the licensee that its geological consultants had identified evidence of faulting in both trenches (memo from Gammill to Denton). Mr. Hofmann, Dr. Jackson and Mr. Morris inspected the trenches on October 22 to observe and evaluate the reported evidence of faulting. Existence of the fault and evidence that it might be "capable," as that term is used in 10 CFR Part 100, were confirmed during our October 22 investigation. The General Electric Consultants believe the observations in the trenches are attributable to earth slides and are preparing new trenches to resolve the issue. The significance of this information is discussed below.

The GETR site is located in the Livermore Valley. Geologically the site is within the Livermore Syncline and is approximately 7500 feet from the nearest mapped strand of the Calaveras fault. The site is within the trace of the Verona fault as postulated by the USGS (Open-File Report Number 77-689). The Las Positas fault, if projected to the southwest, passes within about 10,000 feet of the site.

The Livermore Syncline, the Verona fault and the Las Positas fault must, on the basis of current information, be considered to be genetically related to movement on the Calaveras fault. The Calaveras fault is a major element of the San Andreas fault system. Movement

on the San Andreas and associated faults is ongoing at about 6 cm per year.

The tectonic setting of the site must be considered to be active. The Calaveras fault is known to be moving in a right lateral strike slip direction which results in the rock mass west of the fault being moved northward relative to the rock mass on the east side of the fault. The rate of movement across this fault can be measured in millimeters per year. The Verona fault trends approximately northwest-southeast and at an angle to the north west trending Calaveras fault. The fault dips (apparently to the north) at a low angle. Movement on the Verona fault is of a thrust nature with the northern block being thrust over the block on the south. On the basis of current information, this fault must be considered to be genetically related to the Calaveras fault. On the basis of the genetic relationship of the Verona Fault to the known active Calaveras fault, the close proximity of the Verona fault to the Calaveras fault, and the low angle thrusting revealed by the October 20-22 investigations, we are led to conclude that the Verona fault should be considered to be capable.

Seismological ground motion at the site will likely be controlled by movement on either the Verona fault, on the Calaveras fault or on both. Our assessment of the earthquake potential of the Calaveras fault, based on currently available data, leads us to conclude that the most severe earthquake associated with the fault would be in the magnitude range of 7 to 7.5. An earthquake of lesser magnitude, perhaps 6 to 6.5,

would be associated with the Verona fault. Based on these considerations, either the Calaveras or the Verona fault would be capable of producing ground motions at the site with accelerations of sustained duration in excess of .75g if the earthquake were to be centered along the sectors of the fault nearest the GETR site.

While no precise prediction of the maximum earthquake on either the Calaveras or Verona faults can be made, it is possible to estimate the average occurrence frequency of large earthquakes on the Calaveras fault. These rough calculations lead to estimates of about once in 200 to 700 years for the average frequency of occurrence of a magnitude 7 to 7.5 earthquake on this sector of the Calaveras fault. A higher probability might be indicated by the recent geologic movement on the fault.

Of particular significance in this situation is the fact that an earthquake of this magnitude would be expected to produce offsets of the ground surface, or surface faulting, of several feet. Given the close proximity of the Verona fault to the Calaveras fault, movement on the Verona fault simultaneous with movement on the Calaveras fault would be expected to occur.