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~~G.E. TEST Reactor~~
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Chris Nelson

Dr. Robert Jackson, Leader
Geology and Seismology Section
Geosciences Branch, DSE
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Dr. Jackson:

This letter reports on my study of possible capable faults at the Vallecitos Nuclear Center, California. My comments are based on a review of the reports on the geology and faults of the Livermore Valley area, two site visits to examine trenches across lineaments and areas of suspect landslide head scarps, a low-sun angle aerial reconnaissance of the area, and several meetings with various combinations of your staff, General Electric Company and their geological consultants, Earth Science Associates, and Earl Brabb, Darrell Herd and Bob Morris of the U.S. Geological Survey.

These comments are provisional and represent a largely visual impression that may be substantially changed by reading and studying the final report of the results of the exploratory trenching program of Earth Science Associates. My opinions are still in a formative stage. Nevertheless, I feel that I should express my thoughts at this time, since they may assist you in making decisions on your course of action on this site.

The main body of regional and site specific data is more compatible with a tectonic origin for the fractures or faults near the GETR site, than for a landslide origin as proposed by Earth Science Associates. The present data suggest that there are at least three branches of the Verona fault zone at the GETR site. They are all of low to moderate dip to the northeast and are on both sides of the reactor site. The slip directions have not been thoroughly inventoried by excavations along the strike of the faults, but the several exposures that were adequate, or that could be hand excavated during our visit to the sites, generally suggested primarily reverse-oblique slip directions of displacement. The main fault exposed in Trench A shows prominent horizontal striations in the lower part of the trench, but the soil is offset by shears with a major dip-slip component.

The several features that I believe are incompatible with a landslide origin

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for the shears near the GETR site, as proposed by Earth science Associates, include the following:

- (1) The lack of major shears or pullaparts in the area traversed by the two trenches that were prepared to find evidence for landslide origin (Trenches F and G).
- (2) The lack of a hummocky terrain on the ridge crests.
- (3) The consistent attitude or general appearance of continuity of beds exposed above the range front, north of GETR, with no apparent chaotic breakup, except for local landslides.
- (4) The high and steep escarpment at the front of the range, with no apparent control by differential resistance to erosion between these strata and those of the lowland area around GETR.
- (5) The lack of a lobate tongue at the front of the range, suggestive of gravity transport.
- (6) The well-defined nature of the thrust planes at the front of the range, and in Trenches B-1 and H.
- (7) The recurrent activity on the shear planes, with no evidence for large displacements by gravity type sliding.
- (8) The inconsistent age relationships for movement as shown at the range front shears, with Holocene to late Quaternary slip in at least three events, that appear to extend back to 70,000 to 120,000 years before present, in disagreement with the postulated 10,000 to 40,000 year age of sliding and apparently much younger than the deeply dissected valleys of the range.
- (9) The lack of explanation for a basal slip plane that would cut across the main direction of dip of the beds exposed in the hills to the north of GETR.
- (10) The apparent brittle failure of both the Holocene and Pleistocene slips on the same, well-defined shear planes, with few similar brittle slip planes identified on the hills to the north. These offsets appear to be in moderately well consolidated materials, and may be active in both pluvial and interglacial, dryer periods.

There is a possibility that some gravity induced movement has occurred by slumping of blocks that are bounded by fault planes, but the faults have not been identified, nor has this type of slump block movement been described for this site.

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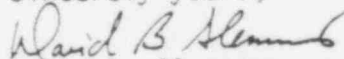
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I am concerned with the general lack of analysis that has been conducted by Earth Science Associates for the types of fault parameters that may be needed if the landslide origin of the shears at GETR are discredited and a tectonic origin established. Much of the data from the trenches, and the possibility of generating significant new data from the relations present in the trenches may be lost if adequate dating studies, slip direction analysis, and time-history of soil and stratigraphic units are not completed prior to closing of the trenches. Types of data that should be studied and evaluated include an integrated study of the total fault length, branching relationships, recurrence intervals, amount of maximum displacement during any faulting event, character of the fault, relationship to the Calaveras fault zone, the inferred Pleasanton fault, the possible truncating structures along the western edge of the Livermore hills, the Las Positas fault and the Williams fault. The acquisition of the types of information that would be important for such an analysis should use much more comprehensive compilation of fault slip directions, a time history analysis of the disruption of the soils and paleosols, identification of the stratigraphic units involved, including the younger gravels, efforts to obtain absolute dates of many of the units involved, review of the regional tectonic picture, with more thorough analysis of the character of the terminating structures, and collection or generation of adequate geophysical and subsurface drill hole data to evaluate the three dimensional relationships of the geology of the siting area.

One question that apparently has not been addressed adequately by NRC as well as General Electric Company is what are the guidelines and limiting relationships for siting a reactor within or very near a capable fault. I recommend that NRC review include preparation for supplying the necessary guidelines in the event that site considerations include a more detailed policy statement in this regard.

Sincerely yours,


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