TESTIMONY OF GLENN BARLOW
ON BEHALF OF INTERVENORS,
FRIENDS OF THE EARTH, BARBARA SCHOCKLEY, AND
CONGRESSMEN DELLUMS, BURTON AND BURTON
FOR THE GETR SHOW CAUSE PROCEEDINGS
U.S. NRC DOCKET NO. 50-70

I hereby testify that I am in complete agreement with the Intervenors' contention that the operation of the GETR and activities under Operating License No. TR.-1 should continue to be suspended permanently because the geologic and seismic issues have not been resolved in a manner adequate to assure federal protection of the public health and safety and because of the following reasons:

1. The GETR is located within the Verona Fault Zone. The Verona Fault is an active capable fault. Seismic activity on the Verona Fault could produce surface rupture and displacements beneath the GETR. The surface displacements would be expected to be comparable to those observed during the San Fernando earthquake of 1971. The seismic design bases for an earthquake on the Verona Fault Zone should include a surface rupture of 2.4 meters simultaneous with ground motions with numerous accelerations above a 1.0 g in both the vertical and horizontal directions. The observed data from the San Fernando quake include a horizontal value of 1.25 g. Thus, to be conservative, the GETR design basis should include a minimum of 1.25 g horizontal accelerations, with peaks above that being possible. Also observed in the San Fernando earthquake was a surface displacement of 2.4 meters. Thus, to be conservative, at a minimum, the GETR design basis should include a 2.4 meter surface displacement.

2. The GETR is located approximately 2 to 3 kilometers from the mapped traces of the Calaveras Fault Zone. The Calaveras is a major branch of the San Andreas Fault System which forms the plate tectonic boundary between the North American Plate and the North Pacific Plate and is the source of major earthquakes. The Calaveras Fault is an active capable fault that is capable of earthquakes of Magnitude 7.0 to 7.5 at any time.

3. The seismic activity on the Calaveras Fault has increased during the 1970's and since the shutdown of the GETR in October 1977. There were several earthquake swarms during that time, and in 1979 a series of strong earthquake shook the Bay Area leading up to the significant Coyote Lake earthquake on the Calaveras Fault in August 1979. Then, in January 1980 a series of earthquakes shook the Vallecitos site and caused millions of dollars of damages to the Livermore National Laboratory(LNL) which is sited a few miles to the east of the GETR. The nuclear reactor at the Livermore labs was damaged during that earthquake and has been permanently shutdown since that earthquake (that earthquake refers to the initial main shock of January 24, 1980.). The Livermore earthquakes of January 1980 triggered sympathetic faulting and surface displacements on the Las Positas Fault which passes near the GETR site between the Calaveras Fault and the Greenville Fault System.

On March 4, 1981, the Vallecitos site again experienced ground motions from an earthquake that shook the entire San Francisco Bay Area, even though it was only a modest Magnitude 4.1. The quake was epicentered on a fault that is near Fremont California (just west of the GETR) between the Calaveras Fault and the Hayward Fault.

4. Californians and the GETR site are currently witnessing a recurrence of a seismic cycle in Northern California that indicates that the San Francisco Bay Area can expect an increase in earthquakes of Magnitude 5.5 to 7.5 earthquakes in the coming years. As noted in number 3 above, the seismic activity on the Calaveras Fault has increased during the 1970's and since the GETR was shutdown in October 1977. This supports the Intervenors' contention that a Magnitude 7.0 to 7.5 earthquake could occur at any time on the Calaveras fault next to the GETR.

During the nineteenth century the Calaveras Fault and its largest branch, the Hayward Fault, experienced many moderate to major earthquakes and this seismic cycle (1836 to 1906) led up to 1906 San Francisco earthquake of Magnitude 8.3. That quake was followed by 50 years of seismic quiescence in the Bay Area (1907 to 1956). Then beginning in 1957 with the Daly City earthquakes in the Magnitude 5.5 range, the seismic cycle of Magnitude 5.5 to 6.0 earthquakes began to recur from 1955 to 1980. Now we can expect the recurrence of earthquakes on the Hayward and Calaveras Faults of earthquakes of Magnitude 7.0 to 7.5. Thus, the five million people who liv

5. In order to be conservative and to assure federal protection of the public health and safety of the five million Californians who live near the GETR, the ASLB should accept that the Calaveras Fault could experience a Magnitude 7.0 to 7.5 earthquake near the GETR between the date of decision by the Board regarding the reopening of the GETR after the OSC hearings, and the date of decision by the Board regarding relicensing of the GETR.

6. If the Calaveras Fault does experience a Magnitude 7.0 to 7.5 earthquake near the GETR at any time, the GETR site could expect, and thus the GETR seismic design basis should include, vertical ground accerations in excess of the 1.74 g instruemental data recordings from the Imperial Valley quake of October 1979 which was a Magnitude 6.9. It is the opinion of the Intervenors that the vertical accelerations could easily exceed 2.0 g during a Magnitude 7.0 to 7.5 quake.

7. Intervenors contend that the activities under Operating License No. TR.-1 should continue to be suspended because the Intervenors contend that the NRC Staff and the Licensee have not complied with the requirements of 10 C.F.R., Part 100, Appendix A in terms of"Required Investigations" for the evaluation of seismic and geologic siting criteria for nuclear reactors in California. Those regulations state that a "zone requiring detailed faulting investigation" is a zone within which a nuclear reactor may not be located unless a detailed investigation of the regional and local geologic and seismic characteristics of the site demonstrates that the need to design for surface faulting has been properly determined. The federal regulations continue in 10 C.F.R., Part 100, Appendix A, Section VI("Application to Engineering Design"), subsection (b) ("Determination of Need to Design for Surface Faulting") subsection (1) ("Determination of Zone Requiring Detailed Faulting Investigation").
The relevant quotes from these parts of the Federal Regulations are: "Because surface faulting has sometimes occurred beyond the limit of mapped fault traces or where fault traces have not been previously recognized, the control width of the fault is increased by a factor which is dependent upon the largest potential earthquake related to the fault. This larger width delineates a zone, called the zone requiring detailed faulting investigation, in which the possibility of surface faulting is to be determined.

Section VI (b) (1) described the specific procedures for determining the zone requiring detailed faulting investigations. The specifications state that the largest magnitude earthquake related to the fault shall be used with Table 2, which states that for a Fault that is capable of a Magnitude 6.5 to 7.5 earthquake, the width of the zone requiring detailed faulting investigations would be 3 times the control width.

Now, the control width of the Calaveras Fault is three kilometers. The GETR is located approximately 2 to 3 kilometers from the mapped traces of the Calaveras Fault. Therefore, the area between the GETR and the Calaveras Fault is within the width of the zone requiring detailed faulting investigations for surface displacements that could occur during seismic events on the Calaveras Fault.

Therefore, the GETR and Vallecitos Nuclear Center site is completely within the width of the zone requiring detailed faulting investigations for surface displacements that could occur during seismic events on the Calaveras Fault.

Thus, the Licensee has failed to conduct adequate investigations into the possibility of surface faulting beneath the GETR that would be a result of earthquakes on the Calaveras Fault.

Therefore, in order to be conservative, and in order to assure the federal protection of the public health and safety of the five million Americans who would be adversely affected by earthquake induced accidents at the GETR, and in order to assure that the federal regulations are being complied with, the NRC and the Applicants should assume that the GETR site could experience surface faulting that would be a result of a Magnitude 7.0 to 7.5 earthquake on the Calaveras Fault.

And because this has not been done, I agree with the Intervenors contention that the operation of the GETR should continue to be suspended because this geologic and seismic issue has not been resolved.

8. The Calaveras Fault is overdue for a major earthquake because it is in a state of seismic gap. A seismic gap is defined as any region along a fault within an active plate boundary that has not experienced a large thrust or strike-slip earthquake for more than 30 years. A seismic gap can develop along a known active fault zone or zone of deformation that is seismicly active at one or both ends of the zone, but not in between.

The Calaveras Fault is overdue for a major quake because the last major quakes on that Fault Zone were in 1861 near the GETR site and in 1898 to the north. Other large earthquakes have occurred on a branch of the Calaveras Fault, but they were also in the nineteenth century. Because the Calaveras is a fault within an active plate boundary (the San Andreas Fault System) and because the Calaveras has not experienced a large thrust or strike-slip quake for more than 30 years, it is in a state of seismic gap.

9. The GETR was not designed for surface faulting and it is not conservative to think that any modifications to the GETR would in any way be adequate to assure the public health and safety by assuring that in the case of the Safe Shutdown Earthquake or seismic events on the Calaveras Fault or the Verona Fault, of Magnitudes 7.0 to 7.5 or 6.0 to 6.5 respectively, that the GETR structures, systems and components necessary to assure the public health and safety would remain functional. These include the integrity of the reactor coolant pressure boundary, the capability to shutdown the reactor and to maintain it in a safe condition and the capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures. The GETR cannot be modified to withstand surface faulting on either the Verona Fault or the Calaveras Fault to the extent that these faults are capable of rupturing beneath the GETR. NO modifications are adequate. No one, including the Licensee and the NRC Staff, can assure or guarantee in any way that the GETR could withstand the effects of surface faulting and displacements beneath it. Therefore the GETR should remain shutdown permanently.

10. The ground motions at the site will be amplified and increased as a result of the natural phenomena of seismic focusing or directivity which has been observed in earthquakes in California, in Long Beach 1933, Santa Barbara, 1978, and Livermore, 1980, as examples.

In January, 1980, the GETR was shaken by earthquakes in the Livermore Valley, adjacent to the Vallecitos Valley. The earthquakes were a strong confirmation of the natural phenomena of seismic focusing in the direction of seismic rupture propagation. This phenomena can contribute to higher ground accelerations at the GETR site during a future quake.

I am going to hereby incorporate by reference the following documents as documents that I have reviewed and upon which I am basing my testimony:

1. All documents prepared by the USGS scientists that are relevant to this proceeding, including but not limited to the following: The original map and report by Darrell Herd in 1977 that revealed the existence of the Verona Fault close to the GETR; the written and oral comments and reports and reviews by USGS scientists regarding the Vallecitos site the 1977 shutdown of the GETR; including the USGS input in the NRC Staff SER in 1979 and 1980;

2 All NRC Staff reports regarding seismic and geologic factors at the Vallecitos site since the beginning of the site review in 1977, including the Staff SER inputs from the NRC Geosciences Branch dated 1977, 1978, 1979, and 1980, and specificly including a memorandum to the Chief of the Geosciences Branch dated October 26, 1977, from a NRC STaff Geophysicist from the Geosciences Branch, John Kelleher, regarding the GETR Nuclear Facility. I also specificly include the NRC Geosciences Branch SER of May, 1980, and the SER Input of Ocober 1979;

3. a report entitled "Seismic Gaps and Plate Tectonics: Seismic Potential For Major Plate Boundaries" by McCann, Nishenko, Sykes, and Krause: in Transactions, American Geophysical Union, Fall Meeting, 1978;

4 a report entitled "Origin of the Seismic Gap: What Initiates and Stops a rupture propagation along a plate boundary?" by Keiiti Aki, MIT, June,1978;

5. "Continental Drift and Plate Tectonics" by William Glen, College of San Mateo, by C.E.Merrill Publishing Co,1975;

6. "Processed Data from the Strong-Motion Records of the Santa Barbara Earthquake of August 13, 1979, Three Volumes, by the California Division of Mines and Geology, Special Report # 144;

7. "Engineering Features of the Santa Barbara Earthquake of August 13, 1978" by Richard K. Miller and S. F. Felszeghy, published by the Earthquake Engineerng Research Institute in December 1978;

8. "The Greenville Earthquake Sequence of January, 1980," by Bruce Bolt, T.V. McEvilly, and R.A. Uhrhammer, from the University of California at Berkeley, Seismographic Station;

9. "Peace of Mind in Earthquake Country" by Peter Yanev, by Chronicle Books, San Francisco, 1974;

10. I hereby incorporate by reference all of the Responses that I prepared for the Intervenors Responses to Interrogatories from the NRC Staff and Licensee since the January 1981 pre-hearing conference, including the Intervenors' Joint Updates of Responses to previous Interrogatories from the Licensee and from the NRC Staff.

11. The transcripts of the ACRS meetings regarding the GETR in 1979 and 1980.

The foregoing eight pages are my Testimony and to the best of my knowledge, I believe it to be true.

Glenn Barlow

Glenn Barlow,
Expert Witness appearing on behalf of
Intervenors Friends of the Earth
Barbara Schockley, and
Congressmen Dellums, Burton, and
Burton.