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SUBJECT: Comments on 860528-29 workshop on geology, geophysics & seismology re long-term seismic program. Local seismic network appears to be well designed to gather seiemic data & accurately locate earthquakes in regions surrounding plant.

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June 10, 1986

Hans Schierling, Senior Project Manager
PWR Project Directorate #3
Division of Power Licensing-A
Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Hans:

On May 28 and 29, PG & E and NRC sponsored a workshop on geology, geophysics, and seismology related to the long-term seismic program (LTSP) for Diablo Canyon power plant. This letter summarizes my comments and those of other USGS scientists (Jerry Eaton, Dave McCulloch, and Walter Mooney) who attended the San Francisco workshop.

The workshop provided a balanced comprehensive review of earth science knowledge regarding Diablo Canyon, identifying what we know, the range of current working hypothesis regarding tectonic features, and gaps in our knowledge. Because PG & E is just beginning to acquire field data for the LTSP, discussion concerned previously acquired data, work and interpretations by others, and plans for work under the LTSP. This exchange of information was useful in identifying critical evidence and major data needs, some of which may not have been known to all parties before the workshop. It also disclosed that most of the critical earth-science tasks of the LTSP lie ahead, raising some concern that key earth-science results will be available in time to be fully employed in such other parts of the program as ground motions, seismic hazard analysis, and soil-structure interaction.

Workshop evidence reemphasized that the offshore Hosgri fault is the most likely nearby structure to generate a large earthquake. Its surface trend, shallow marginal folds and faults, and nearby earthquake focal mechanisms are consistent with a northeast-dipping, oblique-slip, reverse fault, but its fault geometry and stratal relations at seismogenic depths, from 1.5 to 10 km, are unknown and contribute a major element of uncertainty to estimates of earthquake potential, magnitude, and mechanism. Other nearby on-land faults, which may generate earthquakes, can be evaluated using conventional land-based geological and geophysical methods. The Hosgri is a more challenging problem, because it lies offshore and seemingly coincides with an important regional tectonic boundary.

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The on-land geological investigations planned under the LTSP and scheduled to begin this summer are appropriately designed to acquire and interpret surface and subsurface geologic and geophysical evidence bearing on fault activity, geometry, and slip history; the techniques to be employed include surface geologic studies, physical exploration of potentially active faults, analysis of drill hole data in late Tertiary basins, and the analysis of seismic reflection and other geophysical data. These mutually supportive investigations should provide numerous opportunities for testing and replicating results and interpretations.

The local seismic network, scheduled to begin operational monitoring this fall, appears to be well-designed to gather seismic data and accurately locate earthquakes in the onshore and offshore region surrounding the plant site. It augments, but does not duplicate, nearby stations operated by USGS and Cal Tech (under USGS contract) and it should contribute significantly to our understanding of offshore earthquake activity and faulting. I expect that PG & E may find it worthwhile to continue the network monitoring program well beyond the life of the LTSP.

Onshore acquisition of seismic reflection data at seismogenic depths (to 15 km) is well along and is to be completed by June 30. These data, all of which are southeast of the plant site, should aid in evaluating Quaternary folding and faulting. Their value might be increased if they were supplemented with similar reflection lines north of the plant site and with seismic refraction lines inland from the plant and parallel to structural trends; such supplemental lines would help evaluate interpretations of crustal structure based on reflection and refraction data near Morro Bay. Some desirable options, however, may be impractical because of topography, access, or cultural limitations.

Offshore geophysical surveys and a contemporaneous offshore experiment to calibrate the seismic network are still in the planning stages and apparently will not begin until the seismic network is operational, probably no earlier than mid-October, 1986. Current plans for the offshore work recognize the importance of acquiring both reflection and refraction seismic records from the surface down to about 10 km, as a means of 1) resolving uncertainties regarding the attitude and earthquake potential of the Hosgri fault at seismogenic depths, and 2) exploring the possibility of a low-angle thrust fault similar to that responsible for earthquakes at Coalinga. I see possible scheduling problems for the offshore geophysical work--if weather conditions at sea in October prevent offshore surveys, most of this work may have to be delayed for many months. If this happens, results that are important to other program tasks may be unavailable until quite late in the work schedule, when program flexibility will be diminished.

Overall, however, the LTSP is clearly headed in the right direction. The scheduled investigations in geology, geophysics, and seismology are appropriate, well-staffed, and with some fine-tuning they are capable of resolving many of the seismic uncertainties surrounding Diablo Canyon. As is recognized by the project team, the pace of acquiring and analyzing data will have to increase in coming months. The program is scheduled for completion in 2 years and, because many tasks are necessarily sequential, time is a critical concern. On the positive side, the workshop provided a very clear report on where the PG & E team is now and where it is going. Despite its relatively narrow scope, I found this the most informative and useful of the meetings to date and I look forward to more such useful sessions as earth-science results become available.

Sincerely yours,

Robert D Brown

Robert D. Brown

Enclosures

cc: Ronald L. Ballard
Gus Giese-Koch
Dick McMullen
Leon Reiter
Ted Algermissen
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John Filson