

Summary Explanation of the Licensing Basis for Diablo Canyon Seismic Issues

The NRC regulations require all nuclear power plants be designed and constructed to withstand an earthquake. Title 10 of the Code of Federal Regulations (10 CFR), Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants," Criterion 2, "Design bases for protection against natural phenomena," requires that structures, systems, and components important to safety be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunamis, and seiches without loss of capability to perform their intended safety functions.

The design of these structures, systems, and components shall reflect: (1) appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated, (2) appropriate combinations of the effects of normal and accident conditions with the effects of the natural phenomena and (3) the importance of the safety functions to be performed.

Additionally, Diablo Canyon was licensed using Appendix A to 10 CFR Part 100, "Seismic and Geologic Siting Criteria for Nuclear Power Plants," which requires that an operating basis earthquake be defined and the nuclear power plant be designed so that, if the operating basis earthquake occurs, all structures, systems, and components necessary for continued plant operation will remain functional, without undue risk to the health and safety of the public.

Appendix A of 10 CFR Part 100 also requires that a safe shutdown earthquake be defined and the nuclear power plant be designed so that, if the safe shutdown earthquake occurs, certain

structures, systems, and components will remain functional to shut down the plant and protect public health and safety. These structures, systems, and components are those necessary to ensure (i) the integrity of the reactor coolant pressure boundary, (ii) the capability to shut down the reactor and maintain it in a safe condition, or (iii) the capability to prevent or mitigate the consequences of accidents which could result in unacceptable offsite radiological exposures.

Pacific Gas & Electric Company (PG&E) satisfied all applicable NRC regulations related to Diablo Canyon's seismic and geologic siting criteria. Diablo Canyon is located in San Luis Obispo County approximately 190 miles south of San Francisco, 150 miles northwest of Los Angeles, and 12 miles west-southwest of the city of San Luis Obispo, California. There are three seismically significant fault systems near the site - the Nacimiento Fault located about 20 miles from the site, the San Andreas Fault located 48 miles from the site, and an offshore zone of geologic faulting, generally referred to as the "Hosgri fault" located approximately 3 miles offshore from the site.

Based on the historic information, engineering studies, and laboratory testings of the seismicity of the region around the Diablo Canyon site, PG&E provided its determination, and the NRC approved, the maximum earthquakes that could reasonably be expected to affect the site. These conclusions regarding the maximum earthquakes that can be expected to occur during the life of Diablo Canyon are listed below:

1. Earthquake A: an earthquake that may occur on the San Andreas fault at more than 48 miles from the site. The duration of strong shaking from such an event is estimated to be about 40 seconds and the magnitude is estimated to be 8.5.

2. Earthquake B: an earthquake that may occur on the Nacimiento fault at more than 20 miles from the site is estimated to be have a duration of 10 seconds and the magnitude is estimated to be 7.5.

3. Earthquake C: large aftershocks that may occur after an earthquake on the San Andreas fault. The magnitude is estimated to be 6.75 or less.

For each of the above postulated earthquakes, PG&E provided the NRC its estimation on the maximum ground acceleration that would occur at the Diablo Canyon site using engineering analysis of the following parameters: (1) Gutenberg-Richter magnitude and released energy, (2) distance from the earthquake focus to the plant site, (3) shear and compressional wave velocities of the rock media, and (4) density of the rock. The maximum ground motion acceleration that would occur from an earthquake at the Diablo Canyon site was estimated to be 0.20g. Therefore, Diablo Canyon is designed for a hypothetical earthquake called the design earthquake that would produce a maximum ground motion acceleration of 0.20g. This design earthquake corresponds to the NRC's definition of an operating basis earthquake, for which those features of the nuclear power plant necessary for continued operation without undue risk to the health and safety of the public are designed to remain functional.

Furthermore, to ensure adequate margin of safety, Diablo Canyon structures and equipment are designed for an earthquake that would produce ground motion accelerations twice those of the design earthquake, called double design earthquake. Therefore, the double design earthquake for Diablo Canyon is 0.40g, and it corresponds to the NRC's definition of a safe shutdown earthquake for which certain safety structures, systems, and components must be designed to remain functional to shut down the plant and ensure public health and safety.

The plant was also evaluated against a 7.5 magnitude earthquake originating in the Hosgri fault. This analysis utilized 0.75g horizontal and 0.50g vertical ground motion accelerations.

To further ensure public health and safety, Diablo Canyon has a seismic reactor trip setpoint of 0.3 g. If the peak ground acceleration at the plant site exceeds this setpoint, the reactor will automatically shut down to maintain plant safety and the health and safety of the public.

As a result, the NRC has concluded that Diablo Canyon has robust structures constructed of very thick concrete walls, solid foundations, and the safety equipment and piping within these structures are seismically restrained and designed and qualified to remain functional during and after a safe-shutdown, "double design" earthquake.

The San Simeon Earthquake that occurred on December 22, 2003, 35 miles from the plant site with magnitude 6.5, and resulted in a ground motion acceleration of 0.04g at the plant site.

This was well below the seismic design capabilities of the plant and did not adversely affect the safe operation of Diablo Canyon Power Plant, or the health and safety of the public.