

# Seismic Risk

and

# Diablo Canyon Nuclear Power Plant

Presented by  
San Luis Obispo



A seismic event is one of the many significant risks of nuclear power.



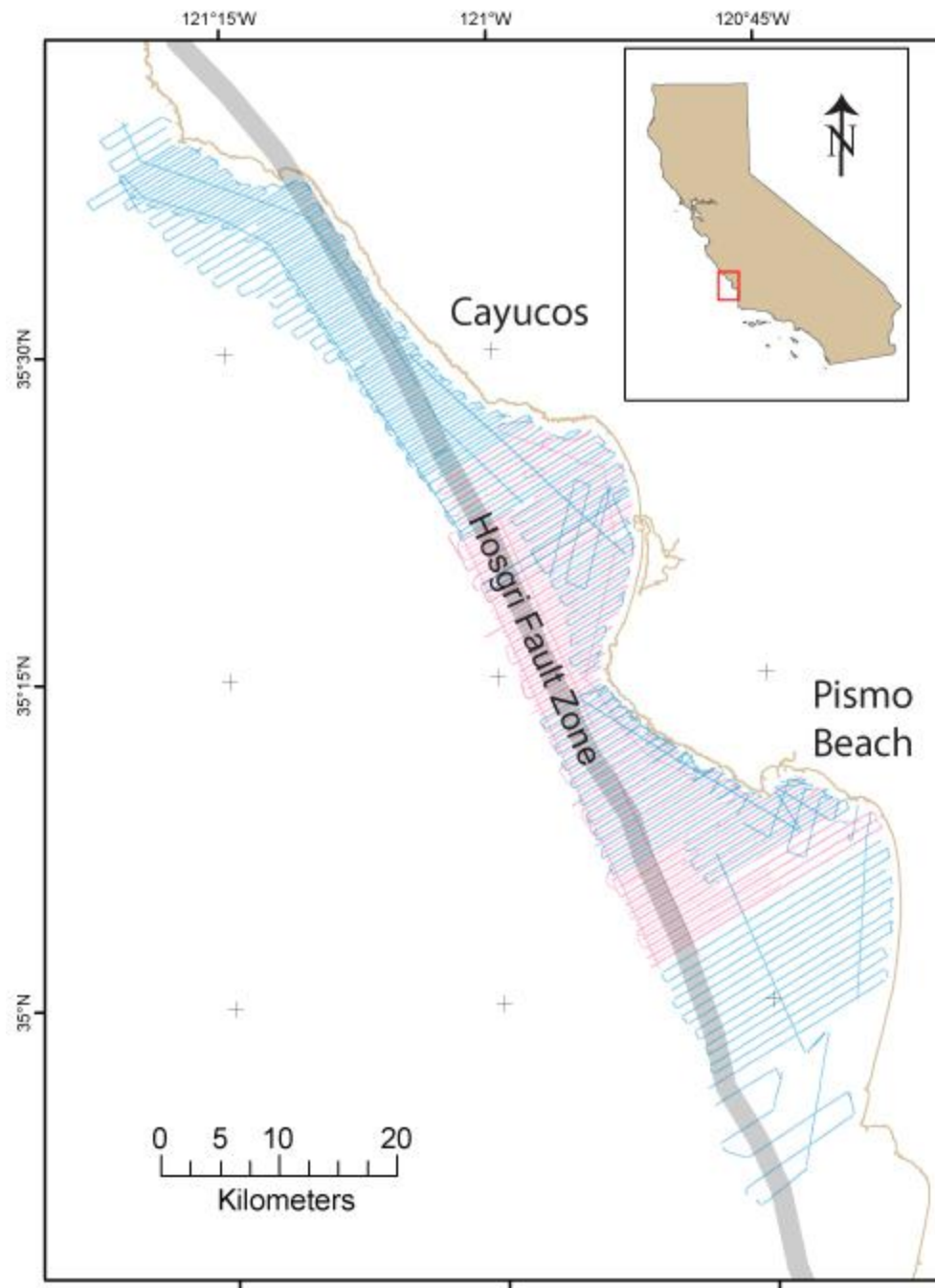


The consequences of widespread radiation contamination is sobering.



Is Diablo  
safe?





The Hosgri Fault is just offshore from Diablo Canyon.

Figure 1. Trackline location map of surveys S-6-08-SC (pink) and S-6-09-SC (blue), Central California. Approximate location of Hosgri Fault Zone (Pacific Gas and Electric Company, 1988) shown.

1973

USGS: "Our findings appear to be of considerable importance."

PG&E: Diablo Canyon had been designed "to handle the greatest earthquake that could occur."

MOTHERS  
for  
PEACE

San Luis Obispo County

# Telegram-Tribune

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Saturday, November 24, 1973

## Undersea 'fault' found near Diablo plant site

By Jim Hayes  
Staff Writer

An undersea scarp — a 10-foot-high displacement in the ocean floor that could have been caused by an earthquake fault only about a mile offshore from the site of Pacific Gas and Electric Company's nuclear plant site at Diablo Canyon — has been discovered by scientists aboard a U.S. Geological Survey research vessel.

Word that seismic recording devices aboard the George H. Kefauver had traced a possible fault "several miles long" on the continental shelf in depths as shallow as 100 feet was hurriedly communicated to the Atomic Energy Commission in Washington, D.C. last week.

"Our findings appear to be of considerable importance," said Gary Greene, who was chief scientist on the research vessel for nine days in mid-November while the Kefauver was sailing criss-cross patterns off the Central Coast from Point Sal North to Point Sur.

"What we have found," said the 35-year-old marine geologist in a telephone interview Friday with the Telegram-Tribune from his home in Santa Clara "are some features which appear to be faults on the ocean floor."

"The displacement could be from an active fault, say of recent geologic time, or about 100,000 years ago."

"The other possibility is that it is what we call differential erosion — the result of wave action in recent geologic times after the general uplift of the coast."

Greene, a graduate of Long Beach State and San Jose State University who's now completing work on his doctorate

in marine geology at Stanford, said he has studied similar ocean floor displacements in Monterey Bay. There, he pointed out, "the scarps were associated with active faults."

It was on one of these northern studies, in late 1970, that Greene helped to throw a scientific monkey wrench into PG&E's plans to build a nuclear generating plant near Davenport in Santa Cruz County.

"I was the chief scientist on that survey," said Greene. "We know there were faults offshore. We took a closer look and discovered that they were active. It was two years from the time we began gathering our data there until it was published. In the meantime, they dropped plans for the plant."

"Of course, PG&E had other problems there. There was the fault at Ano Nuevo and then they had a landslide."

Greene said part of the seismic survey conducted from the research vessel George H. Kefauver was paid for by the AEC.

"USGS was going to do some overall studies in the area and the commission asked us to take a more detailed look at Eureka Bay and the area offshore from Diablo Canyon," he explained.

He described the research vessel Kefauver as a 164-foot ship "very much like the Pueblo" that was used in North Korea."

Aboard the ship, Greene and the members of his geophysical team operate highly sensitive instruments which give a profile of the rocks beneath the ocean floor. As the ship sails a grid pattern on courses that produce one-mile squares, an underwater spark is flashed every four seconds. The sound waves

travel through the ocean to its floor, bounce back from beds of various density and are picked up by hydrophones to be printed out on a facsimile recorder.

"What we got," Greene explained, "is a picture of the ocean bottom as if it had been laid open with a knife."

The picture Greene watched on his recording device as the ship plowed back and forth offshore from the rocky coast at Diablo Canyon showed that there was a layer of miocene rock — presumed to be about seven million years old — underlain by cretaceous deposits that might be as old as 20 million years.

"But the minute we found the scarp — this displacement of eight to 10 feet in the floor — we suspected the presence of a fault."

Greene said the displacement "crossed several lines."

In other words, he explained, the scarp appeared to run for "several miles" parallel to the coast — which trends northwest to southeast at Diablo Canyon.

"Length becomes a critical factor," the geologist added. "Generally, the longer the fault, the more recent and active we think it is."

It's not surprising to find such displacements off the Central Coast, Greene said, explaining that its significance would have to be analyzed by Geologic Survey scientists.

"Our normal procedure," he said, "would be to give a sort of 'in-house' preliminary report to the AEC because they helped pay for the study."

"But if there's enough public pressure, we might open our files to PG&E and to the public. We've already had several inquiries about it, some going



Dotted line shows location of scarp.

directly to Washington."

(Unit 1 of the Diablo Canyon project is expected to be completed by August, 1974 and Unit 2 by a year later. No date had been set for licensing hearings which must be held before AEC will permit the PG&E plant to go into operation.)

Greene said the next step in

investigating the possibly active fault would be to set up a monitoring program.

"Unfortunately," he added, "we don't have any seismic monitoring stations that can be set up in the ocean. Our National Center for Earthquake Research is working on that now."

## PG&E: Diablo can handle quakes

A Pacific Gas and Electric Company spokesman said Friday that its \$550 million nuclear plant under construction

Diablo Canyon plant, the first unit of which now is 70 per cent complete, was designed to

California shoreline made by the Shell Oil Co. and an earlier Geologic Survey report. (Annoyantly, he was referring

"You can suspect faults offshore," he said. But, he added, the plant was designed "to handle the greatest earthquake

In Oakland, Hank Bowden, public information officer for the AEC's operations office, said the agency would not have



# 14-year 'cover-up'

## PG&E declined to pursue fault

By Carl Neiburger  
Staff Writer

Pacific Gas and Electric Co. found evidence of an earthquake fault within 500 feet of the Diablo Canyon nuclear power plant in 1967 but chose not to pursue it to avoid "additional speculation and possibly delay the project."

The information was revealed in a 14-year-old memorandum received by the Telegram-Tribune today.

The document described an April 20-21, 1967, meeting between PG&E and Atomic Energy Commission officials to discuss PG&E's proposal to build the Diablo plant.

The Atomic Energy Commission was the predecessor of the Nuclear Regulatory Commission, which now has charge of licensing nuclear power plants.

The memorandum said a "significant" fault had been found in the cliffs above Diablo Cove.

It said that PG&E geology consultant Richard H. Jahns theorized that "this large fault does not run through the site but probably passes to the northwest."

AEC officials "suggested that the exposed fault at the seawall be traced ... to establish its exact location in relation to the containment."

PG&E officials replied "they did not believe this was necessary and that further information of this type would only complicate a contested hearing."

The memo doesn't say how AEC officials responded to this, and NRC officials who attended the meeting said they didn't remember the discussion.

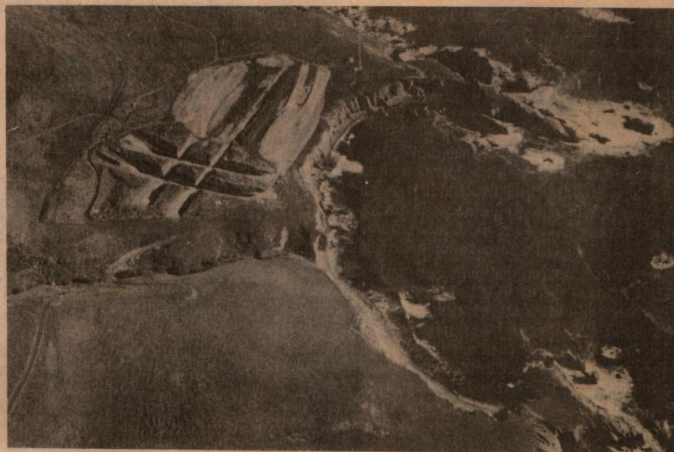
The hearing, at which PG&E was granted an AEC construction permit for the plant, was held Feb. 20 and 21, 1968. The permit was approved on April 23, 1968.

"It's a cover-up. Unbelievable," declared David S. Fleischaker, a lawyer for plant opponents.

"This, on top of the recent discoveries of design flaws, makes the prospects of the plant ever operating one day very frightening for the people of San Luis Obispo," he said.

"It shows the extent to which PG&E has gone to cover up problems of real safety."

Jahns, the geologist quoted in the memorandum, said the reason the fault wasn't researched further was that rock



PG&E declined to extend trenches shown in this 1967 photo of Diablo Canyon to trace a fault in cliffs near the mouth of Diablo Creek, to the lower right of the plant site, according to an AEC memo.

structures "indicated very clearly" that it had been inactive for the past 100,000 years.

Asked if he recalled any discussion of further trenching complicating a hearing, he said, "That may well have occurred during the meeting as an incidental thing."

Jahns said subsequent excavation during construction of the Diablo plant showed no evidence of active faults running beneath the plant.

The 1967 memorandum was written by Keith Woodward, an engineer who then worked with the AEC. He told a reporter he didn't remember writing that particular report, but his job at the time included sitting in on meetings concerning Diablo and taking notes.

"If it's got my name on it, I must have written it," said Woodward, who said he left the AEC about six months after the Diablo meeting and now works with a Washington, D.C., engineering firm.

Woodward said that when the memo was written, "There wasn't any cover-up intended," but, "The world has changed a lot in the last 15 years...."

"When we were licensing these plants (then) we didn't spend anywhere near

the amount of time on engineering problems that we do today."

The Telegram-Tribune contacted several other PG&E and NRC officials and consultants who were listed as attending the 1967 meeting. None were able to remember details of the session.

PG&E representative Suzanne G. Brown said she had asked PG&E engineers who attended the meeting to research their files for records of what happened.

Existence of the memorandum was reported by Stanley Mendes, a Santa Barbara structural engineer, who said it was obtained under a Freedom of Information Act request.

The fault described in the 1967 memorandum was discussed in more detail in PG&E testimony submitted for Diablo licensing hearings in December 1978.

The fault in question "appears on the sea cliff at the mouth of Diablo Canyon, trends northeast and projects toward the ground in the northernmost part of the power plant site," the 1978 report said.

It concluded that the fault wasn't important because microscopic studies had shown minimal evidence of movement.

1981:  
PG&E found evidence of an earthquake fault within 500 feet of the Diablo Canyon nuclear power plant in 1967 but chose not to pursue it to avoid "additional speculation and possibly delay the project."



EVERYTHING  
SOUNDS OK  
TO ME!

YEA!  
LOOKS OK  
TO ME



Mark Bryner © 84



# NRC: Diablo quake fault no cause for panic

LOS ANGELES (AP) — A new analysis that suggests an earthquake fault may pass directly under the Diablo Canyon nuclear power plant is nothing "to panic about" but does justify further study, a federal geologist says.

But anti-nuclear critics urged Nuclear Regulatory Commission officials not to approve a full-power operating license for the plant until

the proposed study of earthquake risks is completed in July 1988.

To do otherwise means the NRC considers that people living near the plant are "expendable," said Sandy Silver of Mothers for Peace, a group that has fought Diablo Canyon for more than a decade.

The new analysis of the Hosgri earthquake fault was discussed Thursday as a subcommittee of the NRC's Advisory Committee on Reactor Safeguards met in Los Angeles. The subcommittee considered a proposal by NRC geoscience chief Robert E. Jackson, who called for a detailed study of the nuclear plant's vulnerability to quakes.

The full advisory committee will

slip" fault that was no closer than 3 miles offshore from Diablo Canyon.

Jackson's analysis of Crouch's paper suggests the Hosgri may be a "thrust" fault slashing diagonally toward the plant and passing as close as 1 1/4 miles beneath it.

However, Jackson said the 1 1/4-mile estimate was a "worst-case" minimum, and that the fault may actually pass 12 miles beneath the plant.

"We don't see anything that leads us to panic about it," Jackson said, explaining that the plant was designed to withstand a major quake of 7.5 magnitude on the Richter scale of ground motion — a quake about one-tenth the strength of the 8.3-magnitude earthquake that ravaged San Francisco in 1906.

The analysis means that

safe to operate at full power until the new study is completed in 1988.

Silver of Mothers for Peace, called the quake risk study "yet another proposal to rationalize and analyze away the original, very basic problem of this plant: It was sited in the wrong place."

"... By 1988, we will have two reactors running at full power," she said. "It doesn't make sense."

The possibility the fault may pass beneath the plant "is another big question mark about the safety of the plant and another big reason why they should not yet be allowed to go to full power," said Pamela A. Metcalf of the Absalone Alliance which has sponsored years of anti- Diablo protests.

Brand said if the fault does pass under the plant, it probably is at least 3 miles deep, and therefore the earthquake any

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Sandy Silver from Mothers for Peace called the quake risk study "yet another proposal to rationalize and analyze away the original, very basic problem of this plant: **It was built in the wrong place.**"

1984

1985

A congressional  
report stated  
that the NRC  
had  
"circumvented"  
the licensing  
process.

# Congress report on Diablo: NRC ignored quake danger

By Matt Yancey  
Associated Press

WASHINGTON — Unwillingness to delay the Diablo Canyon nuclear power plant prompted federal regulators to wrongly dismiss fears that an earthquake could trap San Luis Obispo residents, according to congressional investigators.

The Nuclear Regulatory Commission's decision to license Diablo without holding public hearings on how an earthquake might hamper an evacuation during an atomic accident was criticized by the investigators in a 22-page report.

The \$5.6 billion, twin-reactor plant began generating electricity earlier this year.

## Circumvented process?

While not specifically labeling what the commission did as illegal — that issue is now before the U.S. Court of Appeals here — the investigators said the commission "circumvented" the licensing process contrary to the intent of Congress.

"The commission's action would appear to constitute a blatant attempt to escape legal and regulatory requirements that require consideration of safety issues before a nuclear reactor operates at full power," the report said.

The report was prepared by staff aides for the energy power and conservation subcommittee of the House Energy and Commerce Com-

mittee for a hearing today on the commission's handling of Diablo Canyon's license.

## Actions defended

NRC Chairman Nunzio Palladino and the four other commissioners, including dissident James Asselstine, are scheduled to testify at the hearing. Except for Asselstine, the commission has steadfastly maintained in court documents and correspondence with Congress that its actions were proper and legal.

However, Rep. Edward J. Markey, D-Mass., the subcommittee's chairman, questioned Tuesday whether the commission has "resorted to a shell game to keep the public confused and in the dark."

Transcripts from three closed-door meetings last summer, prior to an Aug. 10 vote approving the license, show the commission was clearly troubled by the earthquake-evacuation issue.

## Dropped issue

In 1981, the NRC refused to consider how an earthquake might hamper an evacuation at another California plant, San Onofre. Instead, it promised then to address the issue in future regulations covering all of the nation's atomic power plants.

But when the Diablo Canyon license was ready for approval last summer, the commission had done nothing with the issue.

NRC safety regulators, mean-

while, had concluded that regulations governing all plants were not needed since the only significant threats posed by earthquakes were at the two California plants.

## 'Generic' ruling

Nonetheless, the commission again last summer promised a "generic" rulemaking so that, in Asselstine's words, "it could appear to address the issue . . . remove it from consideration in the Diablo Canyon case and avoid a hearing which might delay the issuance of a license."

At the time, Pacific Gas & Electric Co., the plant's owner, was complaining that each additional day of delay in the license was adding a million dollars in interest costs at the facility.

And NRC attorneys were telling the commissioners that conducting a public hearing on the earthquake-evacuation hearing would delay the facility's operation by a minimum of another nine months.

## Diablo push

"At this late stage, requiring a delay while we wait for a hearing is not in the best national interest," Palladino told his fellow NRC members during a closed-door meeting last July 30.

After Diablo Canyon was licensed, the commission said no regulations on the earthquake-evacuation issue were needed.



1985

Nancy Culver of Mothers for Peace stated that "transcripts of closed-door NRC meetings provide clear evidence that the NRC acted recklessly and illegally."



## New Try to Block Diablo Canyon

By Harre W. Demoro

Mothers for Peace asked the U.S. Court of Appeals yesterday to halt testing at the Diablo Canyon nuclear plant because newly discovered "secret government transcripts" have raised renewed earthquake safety questions.

The anti-nuclear group charged that Pacific Gas & Electric Co. has underestimated the problems of evacuating people after a strong earthquake near the controversial PG&E plant north of San Luis Obispo.

Mothers for Peace asked a three-judge panel in Washington, D.C., which six weeks ago ruled in favor of PG&E, to reopen the case. The group cited new information in recently discovered transcripts of secret meetings last year of the Nuclear Regulatory Commission.

The nuclear agency has granted a full-power license to PG&E to operate one of the two reactors in the plant, which is now being tested.

In granting the license, the NRC approved a plan to evacuate people from the area if there is a potentially dangerous problem in-

side the plant. In its legal action filed yesterday, Mothers for Peace said the plan did not consider that there might be an earthquake before or during the evacuation.

PG&E spokesman Richard Davin said the possibility of an earthquake occurring during an emergency in the plant was "remote." Davin said that PG&E's safety plans cover possible damage to the plant by a severe earthquake.

In a press conference in San Francisco, Nancy Culver of Mothers for Peace said that "transcripts of closed-door NRC meetings provide clear evidence that the NRC acted recklessly and illegally when it chose to ignore the complicating effects of earthquakes on emergency evacuation plans at Diablo Canyon."

Culver said the NRC "deliberately underestimated the dangers posed by earthquakes in order to avoid any further delay in the licensing of Diablo Canyon."

She said the commission did consider emergency preparations for hurricanes, which are unheard of near Diablo Canyon. "You get the feeling that these guys have never been through an earthquake," she said.



1986:  
The struggle  
went all the way  
to the Supreme  
Court.

# Diablo Canyon Nuclear Plant Gets Final Court Approval

By Charles Petit  
Science Correspondent

The U.S. Supreme Court yesterday killed the last legal challenge to the operating license of Pacific Gas & Electric Co.'s Diablo Canyon nuclear plant.

The big utility breathed a collective sigh of relief over the end of 21 years of challenges. Legal expenses since the site was surveyed in 1965 "are in the hundreds of millions of dollars, easy," said utility spokesman James Kilpatrick.

However, foes promised to find new avenues of legal attack on the \$5.8 billion plant.

The high court yesterday upheld without comment a U.S. Court of Appeals decision.

That decision let stand a previous Nuclear Regulatory Commission decision not to require the utility to prepare plans to deal with simultaneous earthquakes and other emergencies at the plant.

"This is it, the last hurdle on our license," Kilpatrick said. "The courts have agreed the chance of this happening, an earthquake hitting right during some other kind of radiological (radiation-releasing) incident, was far-fetched."

Located 12 miles from San Luis

Obispo, Diablo Canyon provides about 15 percent of PG&E electricity.

The suit, although directed at PG&E and Diablo Canyon, was formally brought against the Nuclear Regulatory Commission by a coalition of environmentalist and anti-nuclear groups including San Luis Obispo Mothers for Peace.

The challengers wanted the NRC to hold a series of hearings on the effect of an earthquake during an unrelated emergency, but the NRC refused.

Despite the final legal affirmation of the plant's operating license, "This is not an obituary for our group or citizen opposition to the plant," said Nancy Culver, a member of Mothers for Peace.

"It is true that there is nothing we can take to court right now to challenge the license," she said, "but we are exploring other legal channels."

The major new issue is expected to concern storage of spent fuel in large pools of water at the Diablo Canyon plant, a standard practice in the nuclear industry.

Hearings on used fuel storage at the plant are set for March before the Atomic Safety and Licensing Board of the NRC. The Mothers for Peace will be joined by the San Luis

Obispo regional chapter of the Sierra Club in opposing long-term storage of nuclear waste at the plant.

Such on-site storage, made necessary because the federal government has not found permanent storage facilities for high-level nuclear waste, has become an issue at many of the nation's 100-plus atomic power plants.

In another major action that will affect California, the Supreme Court agreed to decide the constitutionality of requiring developers of beach-front property to provide public shoreline access.

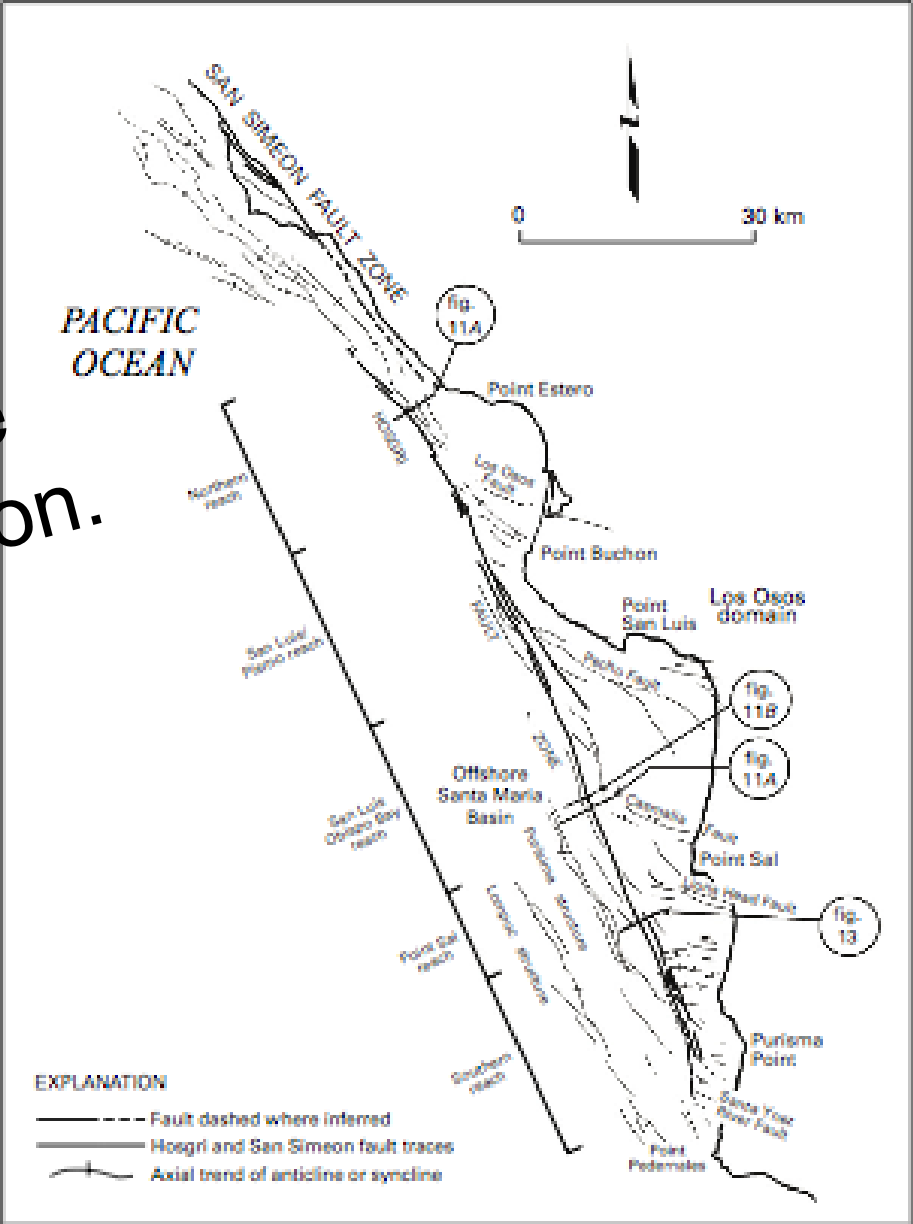
The appeal, which will be heard in the high court's current term, was filed by James and Marilyn Nollan, who are challenging a ruling of the California Coastal Commission.

As a condition for demolishing a bungalow and replacing it with a new home on the Ventura County coast, the commission required that the Nollans grant a public access easement across the front of their seaside property.

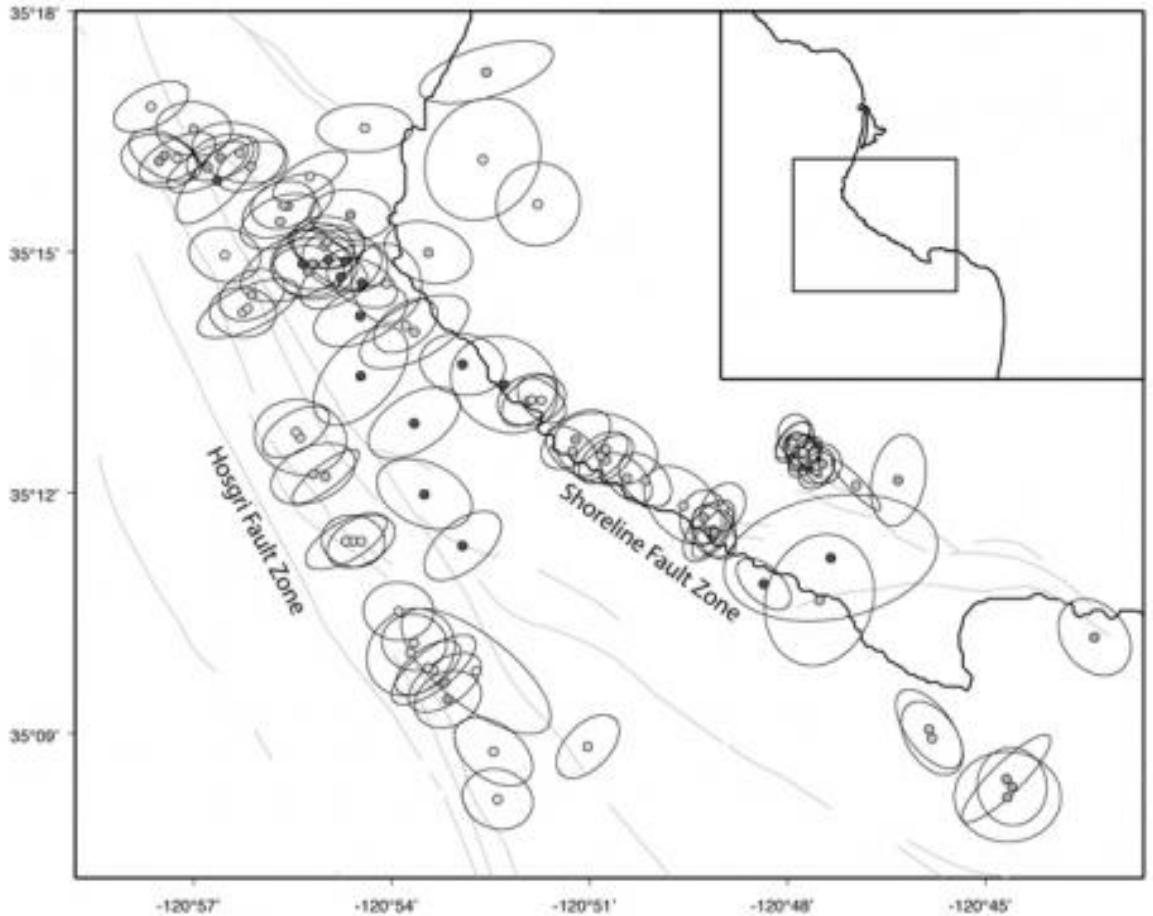
A Superior Court decision invalidated the law governing the commission's action. However, the state Court of Appeal ruled in the state's favor. Jack Liebster of the Coastal Commission said yesterday the easement condition was "standard" for new beach-front development.



There are a multitude  
earthquake faults in the  
vicinity of Diablo Canyon.



2008  
The Shoreline  
Fault was the  
most recently  
discovered fault  
in the area. It is  
less than a mile  
offshore.



*The Shoreline Fault was identified by interconnecting the epicenters of earthquakes dating back to the 1980s that were clustered in the area.*

**PHOTO COURTESY OF USGS**





2010

The discovery of the Shoreline Fault coincided with PG&E's application to renew its license and reignited community concern and the demand for more seismic studies.

The Tribune (San Luis Obispo)  
August 9, 2010, p. A1

# Diablo talks to focus on earthquakes

Workshop speakers will take questions about seismic issues affecting nuclear power plant

By DAVID SNEED  
dsneed@thetribunenews.com

The Nuclear Regulatory Commission has scheduled a two-day public workshop in September in San Luis Obispo to discuss the science of earthquakes and how they affect the Diablo Canyon nuclear power plant.

Speakers at the event Sept. 8 and 9 will include Joaquin Ruiz, president of the Geological Society of America, James Boyd, California energy commissioner, and other seismic experts. The purpose of the event is to increase the public's knowledge of the sci-

## NRC EVENT NEXT MONTH

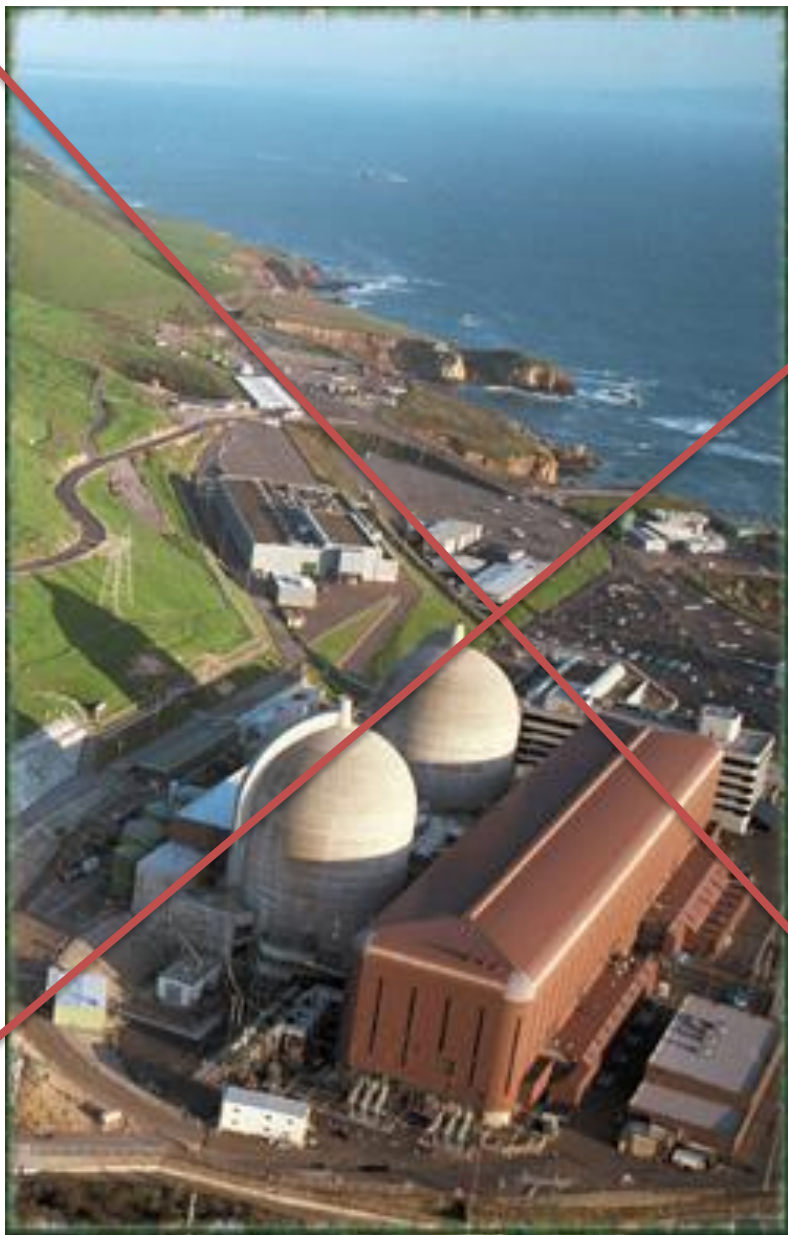
The Nuclear Regulatory Commission workshop will be Sept. 8 and 9 at Embassy Suites, 333 Madonna Road in San Luis Obispo. Both sessions start at 8 a.m. To register for the free event, visit [www.nrc.gov](http://www.nrc.gov).

ence of earthquakes and how it relates to nuclear power plants.

"The workshop will pro-

See DIABLO, A7





2010

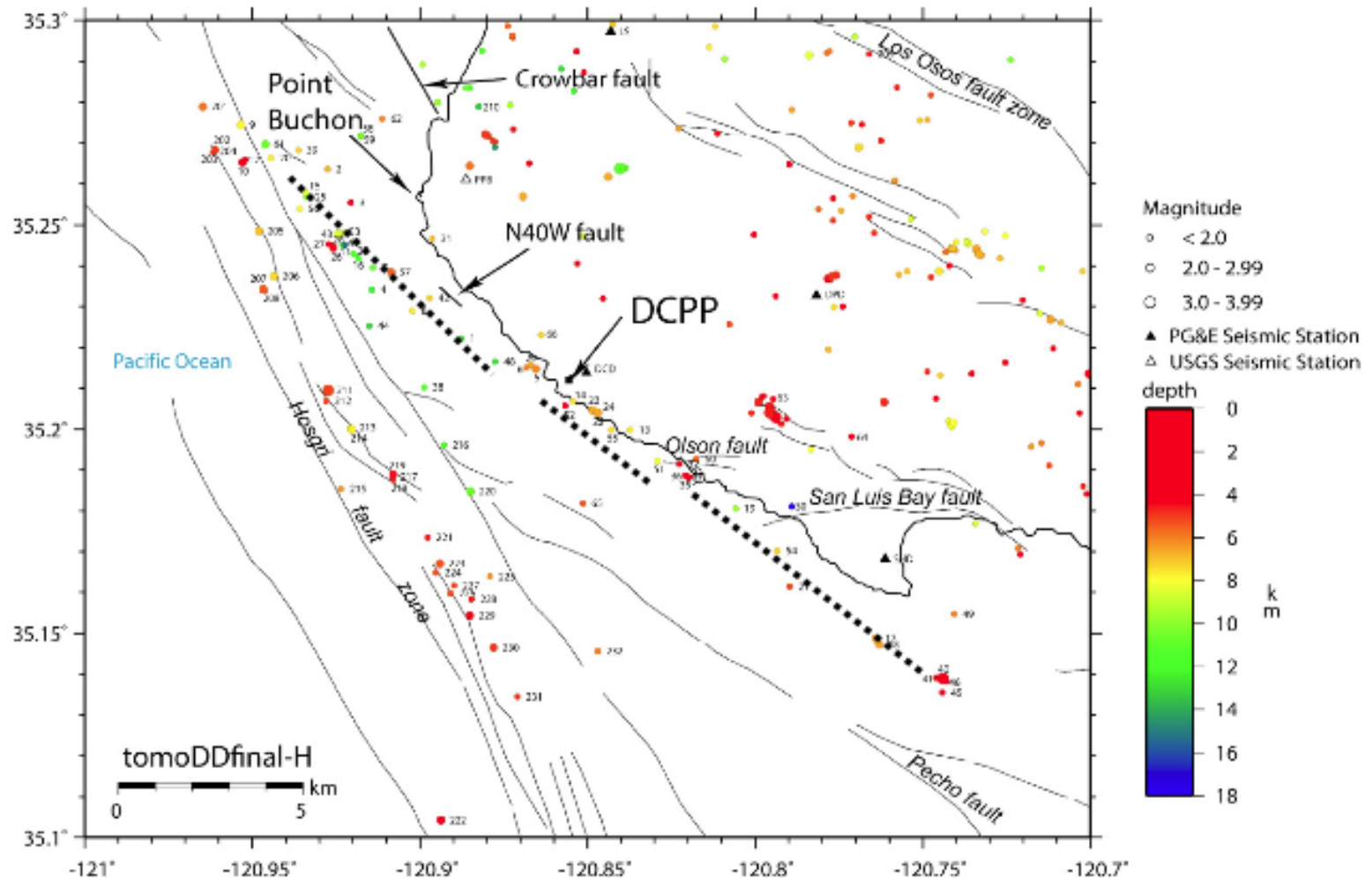
Mothers for Peace has intervened to oppose the license renewal for Diablo Canyon. Four contentions have been accepted for litigation – two of which relate to the potential environmental impacts of earthquakes.

In the wake of the crisis in Japan, concern about the safety of our own nuclear facilities by government officials has been encouraging.






2011: The proceedings have been delayed until seismic studies are complete.



<http://www.oyetimes.com/news/america/10179-californias-diablo-canyon-nuclear-power-plant-located-on-a-fault-line>



Mothers for Peace  
supports shutting down  
nuclear plants and  
investing in clean,  
renewable energy.



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