PG&E overlooked key seismic test at Diablo Canyon nuclear plant

By David R. Baker

March 7, 2015 Updated: March 7, 2015 8:19pm

PG&E swapped out gear at Diablo Canyon nuclear plant in San Luis Obispo County without testing whether the replacements could withstand a major quake on the nearby Hosgri Fault.

Pacific Gas and Electric Co. replaced $842 million of equipment at the heart of the Diablo Canyon nuclear plant without first making sure the new gear could pass a vital seismic safety test required in the facility’s license, The Chronicle has learned.

Starting in 2008, PG&E swapped out the plant’s old steam generators and reactor vessel heads without evaluating whether the replacements could withstand a major earthquake on the Hosgri Fault — just 3 miles away — and a simultaneous loss of cooling water within the reactors.

Instead, PG&E evaluated each scenario — the earthquake and the loss of coolant — separately, even though Diablo’s license requires that the two be considered together. A severe quake, after all, could rupture pipes connected to the reactor vessels and cause the water to drain, potentially leading to a meltdown.
PG&E spotted the mistake in 2011, a year after the last replacement equipment was installed at Diablo Canyon, perched on a seaside cliff near San Luis Obispo. The utility insists that its own analysis, performed after the company found the mistake, shows the new equipment would survive an earthquake and loss of coolant after all.

“Engineering and seismic experts performed a subsequent evaluation and confirmed there is sufficient margin in the components’ design to withstand a very rare event of a combined earthquake on the Hosgri Fault and a loss of coolant accident,” said PG&E spokesman Blair Jones. He called the possibility of such an event “infinitesimally small.”

That doesn’t comfort Diablo Canyon’s critics, who have often accused PG&E of overstating the plant’s strength and underestimating the seismic threats it faces. Earthquake safety has been a concern at the plant ever since the Hosgri Fault was discovered in 1971, three years after construction at Diablo began. Another fault that passes within 2,000 feet of the reactors, the Shoreline Fault, was found in 2008, after the plant had been operating for two decades.

'Same mistake’ in Japan
“I’m frightened that they’re making almost the exact same mistake we saw at Fukushima,” said Daniel Hirsch, a lecturer in nuclear policy at UC Santa Cruz.

The 2011 meltdown of three reactors at Japan’s Fukushima Dai-ichi nuclear plant happened after an earthquake triggered a tsunami that swamped the plant, knocked out its power systems and led to a loss of coolant. The crippled plant still leaks radiation into the sea.

“There was a too-cozy relationship between the nuclear industry and regulators in Japan, and that led to the fiction that it was very unlikely that you’d have an earthquake and a tsunami and a loss-of-coolant accident at the same time,” said Hirsch, who also serves as president of Committee to Bridge the Gap, a grassroots nuclear safety group.

The error comes to light as environmentalists, who tried to block Diablo’s opening decades ago, are pushing hard to close the facility.

California’s only other nuclear plant, the San Onofre Nuclear Generating Station, shut down in 2013 after a small leak of radioactive steam revealed serious problems with the station’s own replacement steam generators, which had a different design than the original equipment. That doesn’t appear to be an issue with Diablo Canyon, whose new steam generators feature the same basic design as their predecessors. But San Onofre’s closure emboldened antinuclear activists.

“If key safety equipment has been installed using the wrong data, (Diablo Canyon) needs to be shut down, and we need a public, transparent investigation into the adequacy of the license and the safety of this plant,” said Damon Moglen, senior adviser to the Friends of the Earth environmental group.

**Critics blast regulators**

The plant’s government regulators are a big part of the problem, critics allege.

The U.S. Nuclear Regulatory Commission, which oversees the nation’s nuclear plants, should have caught PG&E’s mistake before the new steam generators and vessel heads were installed, they say. Instead, the commission learned about the error from PG&E, reviewed the company’s after-the-fact seismic assessment and agreed that the plant was safe. No fines or violation notices were issued.

Meanwhile, the California Public Utilities Commission, which gave PG&E permission to spend its customers’ money on the replacement equipment, didn’t know about the missed seismic test until told about it by a Chronicle reporter, a PUC spokesman confirmed. And since the Nuclear Regulatory Commission — not the state — is supposed to regulate nuclear plant safety, knowledge of the error would not have affected the PUC’s decision, said spokesman Christopher Chow.

“This matter is within the jurisdiction of the NRC and not the CPUC,” he said.

Friends of the Earth last year filed a lawsuit claiming the Nuclear Regulatory Commission illegally allowed PG&E to amend the seismic safety portion of its license without public hearings. The move came after one of the commission’s own former inspectors at Diablo Canyon argued that the plant was no longer operating within the terms of its license and should be shut down until PG&E demonstrated it could withstand earthquakes from several recently discovered fault lines, including the Shoreline. The commission rejected that idea.
“This is a regulator who’s not prepared to regulate and didn’t come down on a key safety issue,” Moglen said. “It’s a regulator who’s looking the other way.”

Earthquake fears have dogged Diablo Canyon throughout its history.

PG&E decided to locate a nuclear facility on the Central Coast after excavation for another proposed plant — at Bodega Bay, in Sonoma County — uncovered a fault line running through the site. When federal authorities approved construction of Diablo Canyon’s first reactor, in 1968, the company said there were no active faults within 30 kilometers, or 18.6 miles, according to Hirsch.

Then oil company geologists reported finding the Hosgri, just offshore. The U.S. Geological Service estimated the fault could produce a magnitude 7.5 earthquake. It was just the first of several faults to be found in the nearby hills and seabed.

“With every study, we’re finding that the seismic threat is larger than previously understood,” said former state Sen, and Assemblyman Sam Blakeslee, who has a degree in geophysics and pushed for more earthquake studies at Diablo Canyon while in office. “It’s remarkable that the facility was put here at all.”

Fault discovered

Hosgri’s discovery in 1971 hardened public opposition to the plant and turned Diablo into a rallying point for America’s nascent environmental movement. It also prompted regulators to require seismic retrofits to the plant before it could open. The work didn’t go well. In 1981, PG&E discovered that some of the new seismic support structures had been built backward, in a mirror image of the way they were supposed to be.

Diablo Canyon finally opened in 1985. Its cost had spiraled from roughly $320 million to $5.8 billion.

Despite the price, California came to rely on Diablo Canyon. In 2011, for example, the plant’s twin reactors supplied about 7 percent of the state’s electricity, all without pumping greenhouse gases into the atmosphere. State officials worried about climate change saw it as a major asset.

The new steam generators were designed to keep that asset running smoothly. The generators convert heat from the reactors into steam that turns turbines to produce electricity. And over time, they wear out. Without replacements, PG&E told the state’s utilities commission in 2005, the entire plant would have to close by 2014. The generators were replaced in 2008 and 2009 for roughly $700 million, a cost passed on to PG&E’s customers.

The vessel heads — which cap each reactor and keep radiation from escaping — were replaced in 2010 and cost $142 million.

That same year, PG&E began an internal effort to examine all the plant’s systems and ensure that the right safety analyses had been performed for each. Owners of other nuclear plants built during the same era as Diablo Canyon had already performed similar evaluations, some of them as far back as the 1990s. PG&E’s effort, called the License Basis Verification Program, turned up the missed seismic test for new steam generators and vessel heads in May 2011.

The utility told the Nuclear Regulatory Commission about the mistake. PG&E conducted an assessment of the gear, all of it installed and in operation for several years at this point, and concluded it would meet the plant’s seismic safety requirements.
The Diablo Canyon nuclear power plant was built before faults were discovered surrounding the area along the coast.

**PUC OKs assessment**

That satisfied the commission. Although PG&E is still finishing a final safety analysis for the equipment, the commission has reviewed PG&E’s work and has raised no issues with it, said commission spokeswoman Lara Uselding. Nor has PG&E reported finding the same kind of mistake with any other equipment at the plant so far, she said.

The mistake remained out of public view, however, until last fall, when California Sen. Barbara Boxer started delving into seismic issues at the plant. In November, a commission official confirmed the mistake to a staff member of the Senate’s Environment and Public Works
Committee. Boxer alluded to it during a committee hearing in December on nuclear plant safety, in which she criticized the Nuclear Regulatory Commission’s oversight of Diablo Canyon.

“Approximately 500,000 people live and work near this power plant, and it is my responsibility and yours to protect them,” she told commission officials at the hearing.

Critics remain unconvinced by PG&E’s — and the NRC’s — assurances that the new steam generators and vessel heads are safe.

“What really worries me is that PG&E is doing with Diablo what it did with San Bruno,” Hirsch said, pointing to the deadly 2010 explosion of a PG&E gas pipeline beneath the Bay Area city. “It’s cutting safety corners and relying on the capture of its regulators to get through.”

David R. Baker is a San Francisco Chronicle staff writer. E-mail: dbaker@sfchronicle.com
Twitter: @DavidBakerSF