

Not My Fault: Prolonging the life of Diablo Canyon nuclear power plant

Lori Dengler/For the Times-Standard

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On Wednesday, the California legislature approved Senate Bill 846 extending the life of Diablo Canyon's two nuclear generating facilities to 2030. Diablo Canyon is the only operating nuclear power plant in the State. It is also California's single largest power facility, producing 8% of the total electricity and nearly a quarter of our non-carbon emitting energy.

Until a few months ago, it was nearly certain that plant operator PG&E was not going to submit an application to continue Diablo's operations past 2024/ 2025 when the Nuclear Regulatory Commission's licenses for Diablo #1 and #2 expire. Last month, Governor Newsom proposed legislation that would keep them going for another five years, and possibly until 2035.

It's not hard to parse out the reasons for Newsom's pivot on nuclear energy. California has been on the path to a non-nuclear future for decades. With the closure of Southern California Edison's San Onofre in 2013 and most State politicians no-nuclear stance, PG&E's decision to shelve Diablo Canyon seemed certain. But the exacerbating climate and energy crises and the slow pace to get large-scale renewable systems up and running were thwarting the State's green-house gas goals.

The need for non-carbon emitting energy in California is clear. The State passed legislation to reduce gas emissions to 40% of 1990 levels by 2030 and in May proposed reaching carbon neutrality by 2045. Senate Bill 846 is a stop-gap measure, intended to keep those goals viable while new methods to expand/store renewable energy and develop carbon capturing technology can be put in place.

Is it safe to operate Diablo Canyon? Two obvious hazards are earthquakes and tsunamis. Diablo Canyon was designed in the mid-1960s. Construction began in 1968 and both facilities were completed in 1973. I've spent some time poking my nose into California's nuclear power history as part of studying Humboldt Bay Unit #3. I've never been to Diablo Canyon or been part of any studies at

the site, but I do have a good idea of how you go about answering the seismic and tsunami questions.

There are similarities and differences between PG&E's first commercial nuclear power venture at King Salmon on Humboldt Bay and Diablo Canyon. Both were built before paleoseismology, the study of prehistoric earthquakes, had become routine for large construction projects. Paleoseismology allows scientists to estimate the size and date of older earthquakes by measuring the age of the rock/soil units that were offset. Landslides and toppled rocks are evidence of shaking strength and ancient tsunami deposits are indicators of both water height and the size of the generating earthquake. When Humboldt's Unit #3 was being built, no one knew that the only fault system capable of producing a magnitude 9 earthquake in California lay only eight miles beneath the site.

As Diablo Canyon was being built, everyone was aware of the San Andreas fault only 45 miles to the east. The architects and engineers knew that this segment of the San Andreas produced an earthquake in 1857 that had a magnitude of about 8. But they were not aware of smaller faults closer to the plant site. The Hosgri fault was discovered during construction. It lies offshore only about two and a half miles from the plant site. Some seismologists believe the 1927 M7.1 Lompoc earthquake was on this fault.

In 2008, geologists discovered another fault (Shoreline fault) lying even closer to the coast, only about a mile west of the plant site. No historic earthquakes have been detected on the Shoreline fault, but there is speculation it could be capable of producing an earthquake in the upper M6 range.

There is a very big difference between the faults discovered after construction of the Humboldt Bay and Diablo Canyon plants. They are in completely different tectonic regimes. Our area is part of the Cascadia subduction zone where stresses are compressive, and we have the potential for M9 earthquakes. South of Cape Mendocino, California's tectonics are dominated by the San Andreas transform system where the fault movement is predominately horizontal.

The San Andreas fault is the largest and longest in the transform system. It has produced a number of historic and prehistoric earthquakes in the upper M7 and low M8 range. Secondary or splay faults in the San Andreas system like the Elsinore and San Jacinto faults in Southern California, the Hayward, Calaveras, and Rogers Creek in the central and northern part of the state are probably capable

of producing magnitude 6 to low 7s. Offshore strands like the Hosgri and Shoreline faults are more difficult to study, but based on their lengths, are likely similar.

Seismic safety depends on understanding where faults are located and how they move, where ground surface rupture could occur, how long/strong/sharp the earthquake vibrations could be, and what other hazards such as landslides, liquefaction or tsunamis could be present. For nuclear power plants, all of these factors are important.

I'd argue that PG&E was much luckier with their siting of Diablo Canyon than the Humboldt plant. While they did find more faults after the plant was built, none lay directly beneath, and they were already aware that a magnitude 8 earthquake could occur nearby. Earthquake engineer Peter Yanev in an op-ed to the San Francisco Chronicle argues that Diablo Canyon is over designed and one of the strongest structures in the State. And a study in 2020 suggested that ground motions near Diablo Canyon were lower than the planning criteria based on the presence of precarious rocks that were still standing (see Not My Fault 11/22/2020)

The most recent nuclear power plant disaster was not the result of ground shaking, but due to a tsunami that breached retaining walls at Fukushima and damaged the backup generators. PG&E had been concerned about the tsunami threat at Diablo Canyon since the 2004 Indian Ocean tsunami. Numerous studies have shown the plant to be lucky in this regard too. It sits at an elevation of 85 feet compared to 20 feet in Japan. Unlike Japan and Humboldt Bay, it does not sit in a subduction zone setting and the largest tsunami is likely to come from Alaska.

From everything I have read and studied, Senate Bill 846 seems like a reasonable measure. It does not solve our energy or climate crisis but may provide a little breathing room to confront the existential problems of our time.

Note: Lori Dengler is giving a free noon zoom presentation, "The Geologic Saga of the Humboldt Nuclear Power Plant," through Cal Poly Humboldt's Osher Lifelong Learning Institute on Monday September 19. Register at <https://extended.humboldt.edu/olli/events/brown-bag-lunch-presentations>.

Lori Dengler is an emeritus professor of geology at Cal Poly Humboldt and an expert in tsunami and earthquake hazards. The opinions expressed are hers and not the Times-Standard's. All Not My Fault columns are archived online at <https://kamome.humboldt.edu/resources> and may be reused for educational purposes. Leave a message at (707) 826-6019 or email rctwg@humboldt.edu for

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