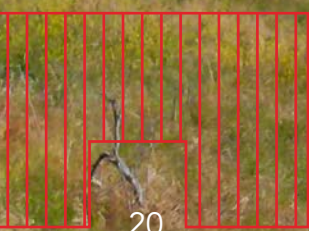


# The Future of Diablo Canyon

While many Californians are hopeful the state's last nuclear power reactor can be saved . . .



By Tim Gregoire

## PG&E is actively preparing for decommissioning.


**T**he reports of the death of the Diablo Canyon nuclear power plant may be greatly exaggerated. While Pacific Gas and Electric (PG&E) announced as early as 2016 that it would be closing California's last operating nuclear power plant at the end of its current operating license, there has been growing political pressure to keep the plant, and its 2,200 MWe of carbon-free energy, running.

Both nuclear energy and environmental advocates have called for continued operation of the two-unit Westinghouse pressurized water reactor. On August 11, California Gov. Gavin Newsom proposed allocating up to \$1.4 billion for a forgivable loan to PG&E to keep Diablo Canyon operating for another five to 10 years.

PG&E, likewise, has shown a willingness to keep Diablo Canyon open, saying this summer that it expected to submit an application to the Department of Energy for funding through the department's \$6 billion Civil Nuclear Credit Program. As of this writing, PG&E has not yet applied for the credit.

The company, however, has not been sitting idly by hoping for an 11th-hour reprieve. For the past six years the company has been drawing up a road map for the decommissioning of Diablo Canyon. Should the plant close, PG&E expects this early planning will accelerate the decommissioning schedule and save the company a significant amount of money in decontamination and dismantlement costs, all while increasing safety and efficiency.

How much money? Speaking at the 2022 Annual Meeting of the American Nuclear Society in June, Tom Jones, PG&E director of government relations, said that "between repurposing and early planning, we have driven over a billion dollars out of the project so far."



The Diablo Canyon nuclear power plant in San Luis Obispo County, Calif.  
(Photo: Wikimedia Commons)

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the company estimated the cost of decommissioning Diablo Canyon to be \$4.1 billion in 2020 dollars.

## The Economics

In November 2018, PG&E officially notified the Nuclear Regulatory Commission that it intended to permanently cease power operations at Diablo Canyon

at the expiration of its existing operating licenses. (PG&E withdrew its 20-year license renewal application with the NRC in 2018.) Diablo Canyon's Unit 1 is to shut down on November 2, 2024, followed by Unit 2 on August 26, 2025. The notification to the NRC followed PG&E's August 2016 filing with the California Public Utilities Commission (CPUC) of a joint proposal with labor and environmental groups in which the company agreed to phase out nuclear power.

In making the decision to close the plant, PG&E said there were several contributing factors, including the increase of California's Renewable Portfolio Standard to 50 percent by 2030, doubling of energy efficiency goals under the state's Clean Energy and Pollution Reduction Act, the challenge of managing overgeneration and intermittency conditions under a resource portfolio increasingly influenced by solar and wind production, the growth rate of distributed energy resources, and the potential increases in the departure of the company's retail load customers to Community Choice Aggregation.

Following notification to the NRC, PG&E submitted an updated post-shutdown decommissioning activities report (PSDAR) to the agency in December 2019. In that report, PG&E said it planned to decommission Diablo

Canyon using the NRC's DECON method, with the majority of decommissioning work beginning soon after Unit 2 is shut down. PG&E's schedule aims at having the plant fully decommissioned, the site (excluding the independent spent fuel storage installation) restored, and its license terminated by 2038.

Included in the PSDAR is PG&E's decommissioning cost estimate of \$5.1 billion in 2019 dollars. That estimate includes the cost of storing the spent fuel and greater-than-Class C waste until it can be transferred to the Department of Energy, completing site restoration work, and terminating the NRC license.

More recently, in PG&E's 2021 Nuclear Decommissioning Cost Triennial Proceeding, which is updated and filed with the CPUC every three years, the company estimated the cost of decommissioning Diablo Canyon to be \$4.1 billion in 2020 dollars.

To conduct the decommissioning, PG&E's Tom Jones said that the company will pursue a "hybrid model," where PG&E will retain the Diablo Canyon license and oversight of the plant but contract out the decommissioning work to an outside contractor. This is similar to the model being used by the San Onofre Nuclear Generating Station in Southern California, where California Edison selected a joint venture of AECOM and EnergySolutions as the plant's decommissioning general contractor.

Given California's regulatory environment, Jones said that this contract model makes more sense for PG&E than methods used by plants such as New York's Indian Point nuclear power plant, where the plant's assets and license were wholly acquired by Holtec International for the purpose of decommissioning. "It is the best model to protect potential future liabilities, maintain your revenue stream, and get the work done efficiently," he said.



## Stakeholder Engagement

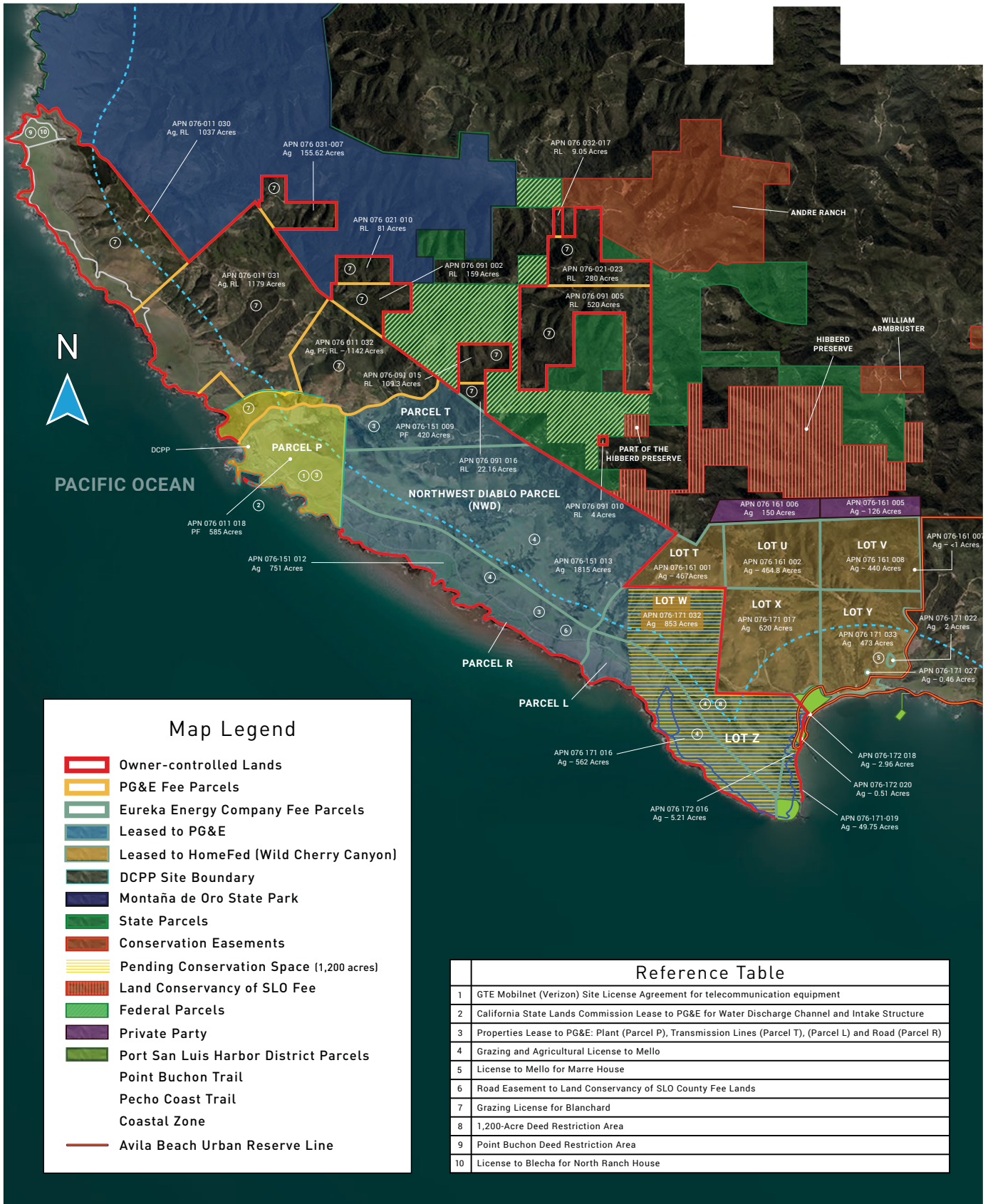
Jones, describing PG&E's efforts to reduce costs and accelerate the decommissioning schedule, said that part of the early planning his company did was to engage with state and federal regulators, along with the surrounding community, to find out what they wanted to see happen at the site. "We knew that if we could drive that process early, we could get alignment with key stakeholders and drive contention out of the regulatory process, preserving our schedule," he said.

Soon after PG&E announced plans to close Diablo Canyon, the company established the Diablo Canyon Decommissioning Engagement Panel, a group of 11 volunteers who review information and provide direct input on behalf of the local community on decommissioning activities.

Jones said the panel membership broadly reflects the community, with knowledgeable members with differing interests and areas of expertise. This includes a radiologist, a member of the local labor union, a representative of the Northern Chumash Tribe, and local officials, as well as a spokesperson for the antinuclear group San Luis Obispo Mothers for Peace.

A spent fuel cask is moved to Diablo Canyon's ISFSI in this screen shot from a video showing a previous campaign to transfer spent fuel to dry storage. (Image: PG&E)





A map of the lands surrounding Diablo Canyon. The reactor campus is located in Parcel P. (Image: PG&E)



“They are not just interested in land use,” Jones said of the panel members. “They are talking about fuel management, labor strategies, and transportation of the waste products. They are also focused on the economic activities, ensuring that we are hiring local skilled labor.”

Jones added that the panel was interested in PG&E’s intended handling of the spent nuclear fuel and the design of its independent spent fuel storage installation. Given Diablo Canyon’s location in a marine environment with seismic activity, community members were concerned about the potential for chloride stress corrosion cracking and earthquake damage.

To build trust with the community, and to ensure transparency, Jones said that PG&E had some of its systems and processes independently evaluated, even though such reviews are not required by the NRC. This included having Diablo Canyon’s dry cask storage design evaluated by the California Energy Commission.

The company also worked with the B. John Garrick Institute for the Risk Sciences at the University of California at Los Angeles on developing a methodology for probabilistic risk assessment of spent nuclear fuel handling and storage programs, assessing the radiological risks associated with storing and moving spent fuel from Diablo Canyon’s two spent fuel pools to its ISFSI.

Jones also noted that PG&E works closely with state and local agencies in planning Diablo Canyon’s decommissioning. Several government entities share jurisdiction over Diablo Canyon’s 750-acre plant site. This includes the NRC, the California Coastal Commission, and San Luis Obispo County. Federal, state, and local permits and approvals are required to

perform nearly every decommissioning activity.

“We have at least one and usually two regulators in California for every single action we want to do,” Jones said. “That is why we do so much stakeholder engagement up front, to keep those issues narrow, build a robust administrative record, and hopefully get through the process a bit easier.”

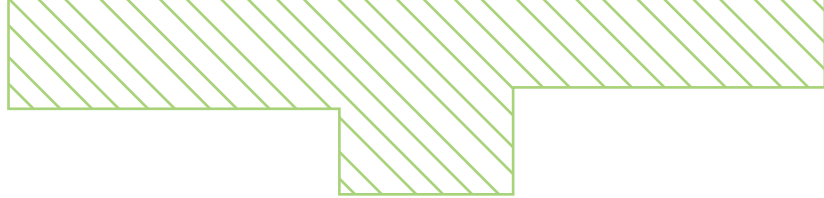


An aerial view of the Diablo Canyon campus, with the ISFSI visible to the left of the site’s two reservoirs, situated more than 300 feet above sea level. (Photo: Wikimedia Commons)

## Cost and Schedule

Located along 14 miles of pristine coastline on 12,000 acres of PG&E-owned land, the remote Diablo Canyon nuclear power site acts as its own little city, with its own water desalination facility, sewage system, and police and fire departments. With all of the auxiliary structures and systems at the site, PG&E has looked into repurposing some of the plant’s infrastructure, saving the cost and time of demolishing and removing otherwise useful assets.

This includes Diablo Canyon’s breakwater and marina. The only protected marina on the coast between Morro Bay and Avila Beach, the marina currently hosts the reactor’s intake



structure and a marine vessel operations center. The breakwater contains twice the amount of material as the rest of the entire reactor complex, Jones said, adding that it would all have to be shipped out of state if it were to be removed.

Instead, PG&E is communicating with outside parties that may be interested in keeping the marina and intake structure and repurposing it for recreational and commercial activities, including supporting the development of offshore wind energy. Retaining the marina would save PG&E about \$400 million in decommissioning costs, Jones said.

PG&E is also developing plans to use the marina to transport waste off-site by barge, which the company says will significantly reduce risk and environmental impact while also reducing total costs. Using barges along with trucks to ship bulk waste will enable large volumes of demolition waste to be shipped for disposal in a short period of time.

Another area Jones said PG&E has been able to reduce schedule and cost is in spent fuel handling. This spring, PG&E announced that it has contracted Orano to transfer Diablo Canyon's spent fuel to dry storage using its Extended Optimized Storage NUHOMS system. According to PG&E, the increased thermal and seismic capabilities of the NUHOMS system will allow the company to complete the transfer of the spent fuel to the ISFSI soon after the plant's scheduled closure.

In its initial filings with the NRC, PG&E assumed a seven-year cooling period before transferring the spent fuel to dry storage. The company later concluded that a four-year cool-

ing period would be adequate. Now, with the new Orano system, the company plans to begin transferring spent fuel to the ISFSI after 3.25 years of cooling, at a savings of \$300 million.

Finally, in 2019, the NRC granted PG&E exemptions from 10 CFR 50.82 regulations, allowing the company to withdraw nearly \$188 million from Diablo Canyon's decommissioning trust fund for decommissioning planning prior to shutdown. This was instead of the 3 percent of the generic amount the NRC allows under 10 CFR 50.75. "It worked out very well for us," Jones said of the exemption.

Accessing the funds allowed PG&E to do preplanning work associated with spent fuel management and site restoration, and according to the company, has allowed it to streamline the decommissioning effort, reduce costs, and accelerate the decommissioning schedule while still enhancing safety and efficiency. ☒

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