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Submission by M. V. Ramana, Professor and Simons Chair in Disarmament, Global and Human Security, School of Public Policy and Global Affairs, University of British Columbia, Vancouver, Canada,[1] 19 August 2022

Nuclear plants are hugely expensive and it has been known for a while that they are "not an economically competitive choice".[2] Thus, building new nuclear plants makes no sense. For decades, nuclear advocates had a comforting response: although expensive to build, nuclear plants are cheap to operate and profitable in the long run. That is no longer true and several utilities operating them are losing money.[3] In many states, the only reason they have been operating is because of massive subsidies.[4] These are unsustainable in the long run, and hence the real question is how to deal with a *dying* source of electricity generation in the United States and elsewhere.

Diablo Canyon, too, faced this problem. In its case, the problem was that its operating costs would be increasing because of necessary technological improvements needed to keep its operatings environmentally acceptable. According to PG&E's own testimony before the CPUC that these necessary improvements would raise the costs of operating the plant by about $400 million a year;[5] its annual operating costs from 2011-2014 averaged around $295 million. An analysis commissioned by PG&E pointed out the obvious: with increasing renewable capacity, "the need for baseload power from the large Diablo Canyon Power Plant will decrease in the post 2025 timeframe".[6] It is worth emphasizing the baseload nature of Diablo Canyon—the plant is not well suited to meeting temporary surges of electricity demand that might last at best a few hours in a day. At the same time, there are multiple other ways, including demand flexibility, to deal with those evening hours.[7]

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[1] Institutional affiliation for identification only. The views expressed are the author's own and don't necessarily reflect those of SPPGA or UBC.

[2] Stephen Ansolabehere et al., "The Future of Nuclear Power" (Massachusetts Institute of Technology, 2003), http://web.mit.edu/nuclearpower/.

[3] Steve Clemmer et al., "The Nuclear Power Dilemma: Declining Profits, Plant Closures, and the Threat of Rising Carbon Emissions" (Cambridge, MA: Union of Concerned Scientists, November 2018).

[4] Cassandra Jeffery and M. V. Ramana, "Big Money, Nuclear Subsidies, and Systemic Corruption," *Bulletin of the Atomic Scientists*, February 12, 2021, https://thebulletin.org/2021/02/big-money-nuclear-subsidies-and-systemic-corruption/.

[5] Diane Curran, "Letter to Secretary Jennifer Granholm and Assistant Secretary Kathryn Huff on Behalf of San Luis Obispo Mothers for Peace," June 28, 2022, https://mothersforpeace.org/wp-content/uploads/2022/06/2022.06.28-Corrected-22.06.27-SLOMFP-Letter-to-DOE-Secy-Granholm.pdf.

[6] MJB&A, "Joint Proposal for the Orderly Replacement of Diablo Canyon Power Plant with Energy Efficiency and Renewables" (Concord, MA: M.J. Bradley & Associates, LLC, June 21, 2016), https://www.pge.com/includes/docs/pdfs/safety/dcpp/MJBA_Report.pdf.

[7] Amory B. Lovins and M. V. Ramana, "Three Myths About Renewable Energy and the Grid, Debunked," *Yale E360*, December 9, 2021, https://e360.yale.edu/features/three-myths-about-renewable-energy-and-the-grid-debunked; Amory B. Lovins, "Reliably Integrating Variable Renewables: Moving Grid Flexibility Resources from

Faced with this outlook, PG&E made the accurate determination that continued operation of Diablo simply did not make economic sense. But then it also went ahead to negotiate a Joint Proposal to retire the facility that involved compensation for affected workers and communities and a commitment to replacing 100% of DCNP's generating capacity with renewables and energy efficiency upgrades, a process that has been widely upheld as a model 'just transition' that links labor, community, and environmental concerns.[8] The proposal to extend Diablo Canyon's operations beyond 2025 not only violates economic sense but also threatens to undermine this model for a transition that might be applicable to other nuclear and fossil fuel facilities elsewhere.

According to your (California Energy Commission) own data, in 2021, the two Diablo Canyon reactors together contributed 16,477 GWh of electrical energy, about 8.5 percent of the total in-state generation of 193,569 GWh. In comparison, renewable energy sources, without including large hydro dams, contributed 66,981 GWh, or around 35 percent of all in-state electricity generated. Between 2015, the year before the Joint Proposal was negotiated, and 2021, electricity contribution from solar photovoltaics has grown by 18,564 GWh, more than what Diablo Canyon contributes. During the same period, natural gas has declined from 117,568 GWh to 97,350 GWh. In 2021, solar PV alone contributed nearly twice as much electricity as nuclear power to California's electricity.

The capacity to deal with the variability of output from solar and wind resources has also improved dramatically. As the California ISO observed, the state illustrates "the meteoric rise of battery storage on the system, a key component to supporting grid reliability" with 2.4 GW—more than the capacity of the Diablo Canyon—being installed in just 2021.[9] In July 2022, CAISO reported that there "is approximately 95,000 MW of renewable capacity and 141,000 MW of energy storage capacity in the queue".[10]

There is little doubt that by 2025, if there is political will, there should be no problem with replacing generation from Diablo with renewables and storage. Spending massive amounts of money to keep Diablo operating is both risky and wasteful.

Models to Results," *The Electricity Journal* 30, no. 10 (December 1, 2017): 58–63, https://doi.org/10.1016/j.tej.2017.11.006.

[8] Tom Dalzell, "Diablo Canyon: A Just Transition for Workers and the Environment," *UC Berkeley Labor Center* (blog), November 30, 2018, https://laborcenter.berkeley.edu/diablo-canyon-just-transition-workers-environment/; Ajay Gambhir, Fergus Green, and Peter J. G. Person, "Towards a Just and Equitable Low-Carbon Energy Transition," Briefing paper (London: Grantham Institute, August 2018); Matthew McKinzie, "Diablo Canyon Nuclear Closure Plan: An Important Model," *NRDC* (blog), June 22, 2016, https://www.nrdc.org/experts/matthew-mckinzie/diablo-canyon-nuclear-closure-plan-important-model.

[9] CAISO, "Storage Was the Compelling Story of 2021, According to Our Newly Published Annual Stats," *California ISO* (blog), February 28, 2022, http://www.caiso.com/about/Pages/Blog/Posts/Storage-was-the-compelling-story-of-2021-according-to-our-newly-published-Annual-Stats.aspx.

[10] Neil Millar, Vice President, Infrastructure & Operations Planning, CAISO, "Memorandum to ISO Board of Governors," July 21, 2022, http://www.caiso.com/Documents/BriefingonRenewables-RenewablesintheGeneratorInterconnectionQueue-Memo-Jul2022.pdf.