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**Comment on CEC on the Need to Reconsider Retirement of the
Diablo Canyon Nuclear Power Plant (Docket No 21 -ESR-01)**

Additional submitted attachment is included below.

August 18, 2022

California Energy Commission

Docket Unit, MS-4

Docket No. 21-ESR-01

715 P Street

Sacramento, California 95814

Subject: Comment on California Energy Commission on the Need to Reconsider Retirement of the Diablo Canyon Nuclear Power Plant (Docket No. 21-ESR-01)

Introduction

The Breakthrough Institute is an independent 501(c)(3) global research center that identifies solutions to environmental and human development challenges. The Breakthrough Institute does not receive funding from industry.

It would be a grievous mistake for the State to endanger reliability by proceeding with the plan to shut down Diablo Canyon Power Plant (DCPP). The

decision to close DCPD is in opposition to improving electricity reliability, public safety, and health while reducing emissions to address climate change.

There is a legitimate basis and need for continuing the operation of the Diablo Canyon Power Plant. Failure to do so would be disruptive and harmful, at the very time when California needs to continue making steady forward progress towards reliable, clean, emissions-free energy resources.

Background

California has not been able to ensure that there are sufficient reliable generation resources. The state has declared multiple emergencies¹ to address capacity shortages, which have resulted in emergency capacity procurement orders. Currently, the country also faces larger supply chain challenges for increasing clean energy capacity, including input commodity shortages and shocks,² as well as import restrictions on foreign solar PV products due to forced labor concerns.³

¹ <https://www.gov.ca.gov/wp-content/uploads/2021/06/6.17.21-Extreme-Heat-proclamation.pdf>

² <https://www.iea.org/articles/what-is-the-impact-of-increasing-commodity-and-energy-prices-on-solar-pv-wind-and-biofuels>

³ <https://www.wsj.com/articles/u-s-solar-shipments-are-hit-by-import-ban-on-chinas-xinjiang-region-11660037401>

Reliability

Future system adequacy without clean firm generation is very questionable. Some studies find that the challenge to reliability in a deeply decarbonized electricity system is ensuring energy availability during periods of prolonged low wind/solar production.⁴ The tendency for lost load events will shift to evenings in the winter months when weather events limit the ability to fully charge storage and summer when loads are highest.

Currently, California's electricity system reliability is under strain to the point that the California Independent System Operator Corporation (CAISO) has requested exemptions from the Department of Energy to run gas power plants at maximum capacity and exceed air quality standards.⁵ CAISO has denied requests by five electricity generating facilities that sought to retire or mothball their power units, and has sought to add new gas generation via emergency

⁴ E3, "long run Resource Adequacy Pathways for Deep Decarbonization in California" 2019

⁵ <http://www.caiso.com/Documents/Sep7-2021-Request-Department-Energy-EmergencyOrder-Section202c-FederalPowerAct.pdf>

procurement to meet perceived needs.⁶ This clearly indicates undercapacity concerns that suggest the state will struggle to ensure stability and reliability of California electricity grid without Diablo Canyon. Simultaneously, expansion of new fossil generation and exemptions for air pollution standards are hardly well-aligned with California's environmental, public health, and climate aspirations.

Flex alerts have become common. Reliability has been reduced by increased wildfire risk. Consumers have taken to providing their own electricity back up in the form of business-based and home-based generators, which are more expensive, less reliable, and more polluting, especially considering their location within communities. Out of necessity, the PUC has endorsed the use of these generators through the Emergency Load Reduction Program (ELRP). The ELRP is a 5-year pilot program designed to reduce energy consumption or increase electricity supply during periods of electrical grid emergencies to reduce the risk of electricity outages when the available energy supply is not sufficient to satisfy the anticipated electricity demand.

In several proceedings, including the Mid-Term Reliability (MTR) and Preferred System Plan (PSP), the California PUC expressed concerns for capacity shortage if no gas generation was added. The Public Utilities Commission issued the order entitled "Decision Requiring Procurement to Address Mid-Term

⁶ <https://www.utilitydive.com/news/california-clash-gas-11-5-gw-proposal-caiso/602039/>

Reliability (2023-2026)” in June 2021.⁷ Part of the order is intended to replace Diablo Canyon. However, the “reliable” procured resources were already expected to be online later than the retirement of DCP by the PSP.

Furthermore, supply chain disruptions and shortages may significantly delay the installation of new generation assets in California. A recent report by American Clean Power found that the rate of wind and solar project installations in the United States has slowed significantly this year.⁸ Freight delays have increased cargo transportation rates and lengthened energy project construction timelines.⁹ Such obstacles will doubtlessly affect new fossil generation projects as well. U.S. Customs and Border Protection has detained large volumes of imported solar PV products due to concerns regarding the use of forced labor in their manufacture,¹⁰ exacerbating existing challenges. The California Energy Commission’s own communications assessing the state’s electricity system reliability have identified supply chain challenges as a serious threat to system planning and procurement.¹¹

⁷ California Public Utility Commission Decision 21-06-035

⁸ https://cleanpower.org/wp-content/uploads/2022/07/2022_CPQReport_Q2_public_version.pdf

⁹ <https://www.iea.org/articles/what-is-the-impact-of-increasing-commodity-and-energy-prices-on-solar-pv-wind-and-biofuels>

¹⁰ <https://pv-magazine-usa.com/2022/08/15/over-3-gw-of-solar-panels-have-been-held-in-us-customs-under-forced-labor-law/>

¹¹ <https://efiling.energy.ca.gov/GetDocument.aspx?tn=244871&DocumentContentId=79046>

Firm electricity generation sources are needed for system reliability and reduce overall system costs. While the CPUC MTR decision procures clean resources including clean firm generation, long-term storage, and resources that are available daily at peak periods to comply with SB 1090, the current preferred system plan (PSP)¹² is unlikely to prove sufficient to meet proposed state greenhouse gas emissions targets. At any rate, even an idealized execution of DPCC's retirement would result in "treadmill decarbonization": the replacement of one clean energy source with another, instead of the use of new clean energy to eliminate existing fossil fuel generation.

To replace a clean, firm resource like DCPD while maintaining reliability, other similar energy sources must already be in place. Firm zero-carbon resources are necessary to meet reliability requirements, namely a very high availability factor over a ten-year period even during continuous 100-hour low-renewable-energy production and grid contingencies as reflected in the 1-in-10-year standards. The already strained California's energy grid requires firm energy to function properly and cannot afford to wait four years between the loss of one clean firm source (i.e., DCPD) and the arrival of ordered (but not yet sited or contracted) replacements. This correlates with comments made by several parties

¹² California Public Utility Commission Rulemaking 20-05-003
<https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M399/K450/399450008.PDF>

on the MTR decision arguing that the timeline is insufficient given likely long lead times for new projects.

The 1000 MW of clean, firm resources ordered as part of the replacement for DCPP in the MTR would arrive too late even if completed on schedule to come online in 2026, yet this outcome is unlikely given that the PSP has pushed the project back to 2028. This was expected, as the CPUC and several of the commenting parties expressed concerns in the MTR about the ability to get that level of geothermal online by 2026. It is unlikely the new geothermal resources can be accelerated, given that the moderate timeline for geothermal development is 7-9 years.

Even if the 1,000 MW of clean firm geothermal were forced to be online by 2026, the PSP found in a sensitivity analysis that system reliability would fall just slightly short of meeting reliability standards. Shifting paired solar and short-term storage facilities to come online sooner produced little effect on mitigating the reliability shortfall. Once again, these results clearly indicate that more clean firm generation is necessary. After the PSP was released, several load serving entities (LSE) provided their own analysis suggesting that less, not more, clean energy and storage is needed than ordered in the MTR and that reduced capacity and storage would still result in a reliable system. It is clear that all of the provided analyses cannot be simultaneously true, but may describe some potential outcomes in a range of possible outcomes. The range of stakeholder analysis

results clearly indicates that small changes in input assumptions can drastically change the results. That means the results are not stable (robust) to uncertainty and the boundaries of the range of outcomes must be determined.

Now is obviously not the time to retire DCCP, yet some stakeholders and policymakers seem determined to employ motivated reasoning to reconcile DCCP's closure with climate and grid reliability goals. It is imperative that adversely impact the already distressed electricity system, such as shutting down DCCP, should not be taken.

Cost

DCCP provides low-cost electricity to the residents of California. Filings with FERC indicate the cost of operation as only \$0.31/kWh. There are costs that are not considered in the FERC filing, including accelerated depreciation, taxes, overhead, and a return to PG&E consistent with the rate case. However, when these costs are considered DCCP provides electricity for approximately \$0.40/kWh.¹³

The planned replacement generation capacity is not expected to reduce costs. The PSP analysis¹⁴ shows that, despite claims made by many groups, adding

¹³ Dr. J. Parsons, MIT, "Reconciling the CEERT, the PG&E, and the Stanford/MIT Estimates of the Cost of Power From the Diablo Canyon Nuclear Power Plant" 2021

¹⁴ CPUC Rulemaking 20-05-003 "ADMINISTRATIVE LAW JUDGE'S RULING SEEKING COMMENTS ON PROPOSED PREFERRED SYSTEM PLAN"

large amounts of solar and storage and shutting down nuclear plants will not reduce the cost to ratepayers. In most cases presented in the document, especially the high electrification case and the more ambitious 30 MMT emission reduction case, the costs are slightly increased. Both of these cases will become more important as the population shifts to electric vehicles and adds air conditioning to residences in response to extreme heat events, and as the state strengthens efforts to reduce emissions.

Closing Diablo Canyon will also increase the midterm cost of capacity according to the PSP. The higher cost of capacity and the underlying drivers and constraints will make it more difficult to add sufficient capacity if another generation shortage occurs in the future.

Multiple studies have concluded that maintaining the operation of DCP is not only cost-effective, it will save significant costs to ratepayers and improve system reliability.^{15,16} Even organizations that have opposed DCP have come to the same conclusion — shutting down DCP will increase emissions.¹⁷

Several programs were adopted as part of the order to retire DCP, including an employee retention program and funding to the local community. To consider

¹⁵ J. Aborn et. al., Stanford/MIT, “An Assessment of the Diablo Canyon Nuclear Plant for Zero-Carbon Electricity, Desalination, and Hydrogen Production” 2021

¹⁶ Newell et. al, Brattle, “Retaining Diablo Canyon: Economic, Carbon, and Reliability Implications” 2022

¹⁷ Union of Concerned Scientists “Countdown to Shutdown”

an upper bound on costs, if these programs were retained and the projects to eliminate the once-through cooling system¹⁸ were implemented, the cost would be approximately \$0.52/kWh. This upper bound is comparable to or less than the planned replacement sources of energy which do not provide firm generation.

The Center for Energy Efficiency and Renewable Technologies (CEERT) 2016 study¹⁹—commissioned by the environmental NGO, Friends of the Earth—was the primary technical justification for retiring DCPD and for facilitating the Joint Agreement to do so.²⁰ However, the study contains several technical flaws, which drastically increase expected DCPD costs. In particular, the study inflates several items such as insurance, employee benefits, operations and maintenance, and others at well above the general rate of inflation in the study, which was taken to be the Federal Reserve’s target of a two percent rate of inflation. For some costs, inflation is assumed to be more than three times the general inflation rate. Escalating costs above inflation comprises roughly 23% of its calculated levelized cost of energy, which is 90% more than the estimate from a joint study from

¹⁸ J. Aborn et. al., Stanford/MIT, “An Assessment of the Diablo Canyon Nuclear Plant for Zero-Carbon Electricity, Desalination, and Hydrogen Production” 2021

¹⁹ J.H. Caldwell et al., Center for Energy Efficiency and Renewable Technologies “A Cost Effective and Reliable Zero Carbon Replacement Strategy for Diablo Canyon Power Plant” 2016

²⁰ H.K. Trabish, Utility Dive, “Anatomy of a nuke closure: How PG&E decided to shutter Diablo Canyon” 2016

Stanford and MIT last year when adjusted for comparison.²¹ What is more, the CEERT study assumes fuel costs well above the historical average²² and inflates these costs despite nominally stable fuel costs in the years preceding publication of the study. The cost of not retiring DCP, as indicated in the CEERT study, are inconsistent with other analysis and the discrepancy is a function of unrealistic assumptions and modeling choices on the part of the study's authors. The CEERT study was used to justify the DCP retirement plan and cannot be relied upon as an impartial or technically robust justification for DCP's closure.

Environmental Impact

The California law SB 1090, nominally requiring the state to "avoid any increase in emissions of greenhouse gases as a result of the retirement of the Diablo Canyon nuclear power plant." Since the addition of supplementary gas power electricity generation was added to address continuing capacity shortages. The five-year operation license for the new gas plants extends beyond the proposed retirement of DCP.

²¹ J. Aborn et. al., Stanford/MIT, "An Assessment of the Diablo Canyon Nuclear Plant for Zero-Carbon Electricity, Desalination, and Hydrogen Production" 2021

²² Nuclear Energy Institute, "Nuclear Costs In Context" 2021

Maintaining the operation of DCPD is the lowest environmental impact option. The impact of constructing DCPD has already occurred. Replacement with other energy sources would require additional and unnecessary impacts. Continued operation of existing nuclear power plants result in lower carbon emissions than other energy sources.

Even if DCPD is successfully replaced with other clean energy sources, the switch will not contribute to the overall decarbonization of the electricity system. DCPD currently produces more than twice the sum of all wind generation or close to half of all solar generation in the state. And unlike DCPD, the wind and solar resources are intermittent and therefore provide less per-unit value to the system overall. The ordered procurement of clean energy sources should be used to retire fossil fuel based energy sources to make more rapid progress toward decarbonization.

Conclusion

The correct solution is to maintain the operation of the Diablo Canyon Power Plant. Continuing to operate DCPD will maximize the clean energy contribution of future clean energy sources installed throughout the state, as these resources can help displace fossil fuel energy instead of simply replacing DCPD's lost clean generating capacity. At the same time, retaining Diablo Canyon as

a generation asset will bolster California's reliability. Keeping Diablo Canyon online further negates potential statewide risks associated with a failure to procure sufficient resources to replace the power plant, and will prevent additional air pollution emissions from fossil generation that would directly impact California communities. Finally, continued operation of DCPD is not only cost-effective, but could also save ratepayers from increased electricity costs. Californian citizens across the entire state are best served by protecting this valuable, clean, reliable, and cost-efficient source of electricity.

Sincerely,

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