

**BEFORE THE PUBLIC
UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA**

Application of Pacific Gas and Electric
Company for Approval of the Retirement of
Diablo Canyon Power Plant,
Implementation of the Joint Proposal, And
Recovery of Associated Costs Through
Proposed Ratemaking Mechanisms
(U 39 E)

Application 16-08-006
(Filed August 11, 2016)

**ENVIRONMENTAL PROGRESS'S PROTEST OF PACIFIC GAS AND ELECTRIC
COMPANY'S APPLICATION FOR APPROVAL OF THE RETIREMENT OF DIABLO CANYON
POWER PLANT, IMPLEMENTATION OF THE JOINT PROPOSAL, AND RECOVERY OF
ASSOCIATED COSTS THROUGH PROPOSED RATEMAKING MECHANISMS**

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PROTEST OF ENVIRONMENTAL PROGRESS

Pursuant to Rules 1.4(a)(2) and 2.6 of the Commission's Rules of Practice and Procedure, Environmental Progress ("EP") files this protest to the above-captioned application filed by Pacific Gas & Electric Company ("PG&E"). EP strongly opposes the Joint Proposal which is the subject of this application, and strongly opposes PG&E's decision to retire the Diablo Canyon Power Plant ("DCPP"). Notwithstanding this protest, EP in a separate motion asks CPUC to suspend all hearings on DCPP in light of the on-going federal and state criminal investigation of CPUC, the withholding of emails involving CPUC President Michael Picker, and the intention by the California legislation to implement reforms or abolish the CPUC.

A. Introduction and Summary

EP is incorporated and organized under the laws of the State of California. EP's principal place of business is in Berkeley, California. EP's President is Michael Shellenberger, a PG&E customer, and many of EP's supporters are residential customers of PG&E.

EP's purpose is to help achieve the dream of universal prosperity and environmental protection for all human beings. EP works with climate scientists, conservationists, citizens, students and environmentalists to educate the public about the need for all sources of clean energy for California energy consumers.

EP's participation in CPUC proceedings is motivated by a desire for cleaner and cheaper electricity that can not only meet current needs but also rapidly replace petroleum used for transportation, and accelerate the creation and diffusion of cleaner and cheaper fuels and technologies globally to achieve its mission.

EP opposes all of the positions on the specific authorities being requested by PG&E in its application because they would violate CPUC's mandate to protect California ratepayers from market manipulation, price increases and pollution.

CPUC must be responsive to the demands of the Governor, the Legislature and civil society. All of these institutions, including CPUC, are on the record supporting California's stated policy objective of reducing greenhouse gas emissions 40 percent levels below 1990 level by 2030, a policy EP also strongly supports.

PG&E should be denied its request to increase electricity rates as future rate increases. Accelerating decarbonization requires radically *accelerated* deployment of near zero-carbon power sources, not their loss or mere replacement. If PG&E should still go forward with DCPD's closure, then any future rate increases should go to adding new power, not paying for the replacement of a power plant that does not need to be closed.

B. Discussion.

1. Achieving California’s 2030 climate objective will require that the state reduce carbon emissions at a rate 7 times faster than it did from 2000 to 2014 — a period that saw the worst economic downturn since the Great Depression.

According to California Air Resources Board, total greenhouse covered by state laws (“included emissions”) in 1990 were 431 million megatons of carbon dioxide equivalent (MMTCO₂), of which 40 percent is 172 MMTCO₂. Achieving that will require California reduce emissions by 259 MMTCO₂ between 2017 and 2030, or 20 MMTCO₂ per year. By contrast, California only reduced its emissions 1.7 MMTCO₂ per year between 2000 and 2014.¹

| | | |
|--------|----------------------------------|--------------------|
| 431 | MT CO ₂ | 1990 Emissions |
| 172.4 | MT CO ₂ | 40% of 1990 levels |
| 258.6 | MT CO ₂ | by 2030, by law |
| 441.5 | MT Co ₂ | 2014 Emissions |
| 12.19 | MT CO ₂ drop per year | 2015-2030 rate |
| 465.91 | MT CO ₂ | 2000 Emissions |
| 1.74 | MT CO ₂ drop per year | 2000-2014 rate |

2. California has been going backwards on emissions since 2011.

Where emissions declined 24 million tons between 2000 and 2010, they have been flat since 2011. Where emissions from California’s electricity sector declined 12 million tons between 2000 and 2010, they actually *rose* 10.45 million tons between 2011 and 2014, the most recent year data is available. The loss of one of

¹ California Air Resources Board (CARB), “2016 Edition California Greenhouse Gas C1:P3 for 2000-2014 — by Sector and Activity,” 2016

the state's two nuclear plants, San Onofre Nuclear Generating Station, known as SONGS, in 2012, which was replaced largely by power from natural gas, is responsible for 55 percent of the emissions increase.

3. California's population will rise and energy consumption could thus rise significantly between today and 2030.

In California, over 90 percent of the emissions counted by California Air Resources Board are from electricity or transportation. Transportation alone is 37 percent of California's emissions.²

Electricity demand is likely to rise with a growing population. The number of Californians is set to rise from 39 million today to 44 million in 2030, a 13 percent increase.³

4. More Energy Efficiency Is Likely to Raise Electricity Rates Without Lowering Overall Electricity Demand

California's per capita electricity consumption has been relatively flat since 1975, hovering around 6,900 kwh per person, with no pattern of increase or decline during this period.⁴ Also during this time, California has had in place aggressive efficiency measures.

PG&E offers no assurance that any of the efficiency measures it would procure would be additional or additive to what is already happening. California already offers generous subsidies for retrofitting homes and for households to purchase more efficient appliances. While there are legitimate and interesting debates over whether even more efficiency programs, investments, mandates,

² CARB 2016

³ California Department of Finance, "Projections: Population" 2016, <http://www.dof.ca.gov/Forecasting/Demographics/projections/>

⁴ CARB, "Per Capita Electricity Sales, 1975 - 2014," http://energyalmanac.ca.gov/electricity/per_capita_electricity_sales.html

subsidies and measures would reduce electricity consumption, what matters here is that there is a very good possibility that California's electricity demand will rise 13 percent rather than rise, as PG&E claims in its Application, simply due to an increasing population.

The efficiency measures could significantly increase rates without reducing consumption or pollution. There is a large body of evidence that additional energy efficiency measures will raise rates, and here we cite just two.

The first comes from a workshop that CPUC co-hosted with the California Energy Commission (CEC) to discuss how to replace the power lost after the closure of SONGS on July 15, 2013.⁵ At that meeting, the heads of the CEC, the California Air Resources Board (CARB), CPUC's then-President Peevey and parties to PG&E's joint proposal all acknowledge that they would replace SONGS with natural gas and not avoid replacing the power through demand reductions resulting from energy efficiency.

CPUC President Peevey was told by Southern California Edison that more energy efficiency would make electricity rates rise, not decline. This is from the transcript:

PRESIDENT PEEVEY: Just a quick question on the energy efficiency. If I'm reading this chart correctly, it's a pretty -- if I read this chart correctly, it's a pretty sizeable increase in rates due to energy efficiency....

MR. HOWARD [Southern California Edison]: We believe you'll see that in the customer bills, but we also have it levelized. So as you invest in energy efficiency you're not going to see direct rate decreases. You will see rates potentially go up as you see less users, as you use more energy efficiency (emphasis added).

⁵ California Energy Commission and California Public Utilities Commission, "Joint Workshop on Electricity Infrastructure Issues Resulting from SONGS Closure," July 5, 2013. http://www.energy.ca.gov/2013_energypolicy/documents/2013-07-15_workshop/2013-07-15_Transcript.pdf

What Edison's Howard is arguing is that even if efficiency works in reducing energy consumption, it will reduce Edison's customer base — just as PG&E is proposing to reduce its customer base — and rates will either remain the same or rise.

The second point of evidence comes from a rigorous study by three University of California – Berkeley and University of Chicago economists that found home weatherization costs twice as much as electricity is saved.⁶

Conventional wisdom suggests that energy efficiency (EE) policies are beneficial because they induce investments that pay for themselves and lead to emissions reductions. However, this belief is primarily based on projections from engineering models. This paper reports on the results of an experimental evaluation of the nation's largest residential EE program conducted on a sample of more than 30,000 households. The findings suggest that the **upfront investment costs are about twice the actual energy savings**. Further, the model-projected savings are roughly 2.5 times the actual savings. While this might be attributed to the “rebound” effect – when demand for energy end uses increases as a result of greater efficiency – the paper fails to find evidence of significantly higher indoor temperatures at weatherized homes. Even when accounting for the broader societal benefits of energy efficiency investments, the costs still substantially outweigh the benefits; the average rate of return is approximately -9.5% annually.

⁶ Meredith Fowle, Michael Greenstone, and Catherine Wolfram, “Do Energy Efficiency Investments Deliver? Evidence from the Weatherization Assistance Program,” June 2015, http://econresearch.uchicago.edu/sites/econresearch.uchicago.edu/files/paper_draft_06_15_clean.pdf

5. Achieving California climate goals requires significantly replacing petroleum in transportation.

Replacing a significant share of petroleum used in transportation with near-zero emissions energy, whether electricity, hydrogen or some other fuel.

California will need to increase electric vehicle (EV) on the road from today's 160,000 to 5 million cars by 2030, according to California Governor Jerry Brown and California Air Resources Board Chair Mary Nichols.⁷ There are 34 million registered vehicles in California with 24 million of them cars.⁸ In 2015 there were 62,166 EVs among the two million cars sold in California.⁹

Much more detailed analyses should be done, but a shorthand example suffices for this Motion. To fuel 5 million electric cars with the same electricity usage as Nissan Leafs¹⁰, **California will need almost the exact amount of electricity annually (17,500 GWh) that would be generated by a near-zero carbon power plant the size of Diablo Canyon.**¹¹ And to generate enough power for 24 million cars, California would require the equivalent of 5 power plants the size of Diablo Canyon.

6. Closing Diablo Canyon will not alleviate curtailment of renewable power.

PG&E's Testimony asserts that keeping Diablo Canyon open will increase the curtailment of RPS-eligible renewables because it cannot easily ramp down during

⁷ Chris Megerian, "California Falling Short in Push for More Clean Vehicles," *LA Times*, December 8, 2015. <http://www.latimes.com/politics/la-me-pol-sac-climate-vehicle-emissions-20151208-story.html>

⁸ DMV, December 2015. <https://www.dmv.ca.gov/portal/wcm/connect/5aa16cd3-39a5-402f-9453-0d353706cc9a/official.pdf?MOD=AJPERES>

⁹ Charles Fleming, "Honda Leads California New Car Sales for 2015," *LA Times*, February 17, 2016. <http://www.latimes.com/business/autos/la-fi-hy-california-car-sales-20160217-story.html>

¹⁰ The Nissan Leaf needs 30 kWh of electricity to travel 100 miles, or .3 kWh per miles. Department of Energy, 2016. <http://www.fueleconomy.gov/feg/Find.do?action=sbs&id=37066>

¹¹ 5,000,000 Nissan Leafs at 0.3kWh per mile, multiplied by 12,000 miles (California average)

periods of over-generation. (These episodes mainly occur on sunny days when surges of solar power threaten to overwhelm the California grid.)

But PG&E's own estimates indicate that closing Diablo Canyon would alleviate just 850 GWh per year of renewables curtailment (**PG&E Testimony, p. 3-8**). This is a trivial amount, about 1 percent of the 84,000 GWh of RPS-eligible RE that CAISO forecasts for 2024.¹² Alleviating the curtailment of those 850 GWh of low-carbon renewable electricity through Diablo's closure would entail the loss of Diablo's 17,660 GWh of low-carbon electricity.

PG&E argues that "The CAISO needs resources with ramping flexibility and the ability to start and stop multiple times per day based on real-time grid conditions" (**PG&E Testimony, p. 2-20**)—in other words, natural gas plants with all their carbon emissions.

But the expedient of shutting Diablo will bring little reprieve from the curtailment crunch. That's because renewables curtailment isn't caused by nuclear power, it's caused by other renewables—especially solar panels that overgenerate on sunny days. CAISO studies suggest that by 2024, with a 40 percent RPS penetration, the marginal curtailment rate of additional increments of solar generation will be 28 to 34 percent;¹³ that marginal curtailment rate will increase rapidly as solar penetrations grow.

Rather than easing curtailment, closing Diablo to make way for more solar makes curtailment problems worse.

¹² CAISO, "Report of the No Renewable Curtailment Sensitivity Case Studies;" https://www.caiso.com/Documents/May8_2015_DeterministicStudies_nocurtailment_Existing_Trajectory_40percentRPS_R13-12-010.pdf

¹³ CAISO, "2015-2016 Transmission Plan" pp. 254-56, <http://www.caiso.com/Documents/Board-Approved2015-2016TransmissionPlan.pdf>

7. DCPD will be replaced mostly by fossil fuels either within PG&E’s “bundled load,” its service territory, California, or the United States.

Every kilowatt-hour of renewable electricity that’s used to replace low-carbon nuclear power is a kilowatt-hour that’s not available to displace fossil fuels from the grid. Because of that lost decarbonization opportunity, Diablo’s lost power should properly be regarded as being *entirely* replaced by fossil fuels, for as long as there are fossil fuels on the grid. By that truer measure, Diablo’s closure will result in an extra 144 million tons of carbon dioxide emissions than would occur if the plant were to renew its license and operate until 2045.

One of the architect of the Joint Proposal himself acknowledged at the workshop that SONGS would need to be replaced by natural gas not efficiency. V. John White, whose renewable energy, natural gas and energy efficiency industry association, Center on Energy Efficiency and Renewable Energy Technologies (CEERT) was hired by Friends of the Earth to create the framework for the Joint Proposal, acknowledged that efficiency and demand response would not be anywhere near enough to replace SONGS. White said the choice was between electricity imported from out-of-state or new natural gas electricity production in state. “We really have choices to make between are we going to import electricity or are we going to import gas and burn it.”

The strongest advocate of building more natural gas plants to replace SONGS was Alliance for Nuclear Responsibility. Its lawyer, former California Energy Commissioner John Geesman, urged CEC and CPUC to expedite natural gas burning:

Now, I am a big advocate of transparency and all of that stuff, but those of us that trace our political genealogy back through the Grey Davis Administration know that first and foremost you keep the damn lights on.... I think if you can find gas-generation capacity, you ought to take advantage of that opportunity.... And I think that those are the marching orders you’re under. It certainly should be....

PG&E's Application and Testimony prey on widespread confusion about three different things:

1. California's electrical grid;
2. PG&E's *service* territory: all consumers who receive electricity through PG&E's power lines, including those customers who buy power from alternative retailers known as "Community Choice Aggregators" (CCAs);
3. PG&E's "bundled load": those customers in PG&E's service territory who purchase their electricity from PG&E, not from a CCA.

PG&E justifies its proposal to close DCPD and raise electricity rates on the basis of the needs of its *customer base* while ignoring the impact on PG&E's *service base* and on California's *whole electrical grid*.

In its Testimony, PG&E argues that the electricity usage it supplies will decline for three reasons:

- Lower demand due to greater energy efficiency;
- Lower demand due to more "distributed generation" such as rooftop solar.
- Migration of its customers to CCAs.

However, this accounting focuses on just one part of California: PG&E's shrinking bundled load, not its larger service area or California. And while the focus here is California, CPUC should reject any proposal that would result in higher emissions in other states from natural gas electricity generation exported to California. Currently, California imports about one-third of its power. If California is truly committed to climate goals, then simply exporting its pollution to other states cuts against the effort to reduce emissions in the US as a whole.

8. More natural gas electricity generation would very likely increase deaths from pollution and pipeline explosions.

On September 9, 2010, a Pacific Gas & Electric (PG&E) natural gas pipeline running underneath the city of San Bruno, California, exploded, killing eight people and destroying 38 homes. Six years later, a federal jury found PG&E, California's largest electric utility, guilty of violating safety regulations and deliberately misleading investigators. PG&E's lawyer argued to the jury that "Nobody at PG&E is a criminal."¹⁴

But even without criminal or unethical conduct, natural gas is far more dangerous than uranium, the fuel used by DCP. In a large review of the evidence compiled for the British medical journal *Lancet*, scientists found that nuclear power is the safest way to make reliable power. Natural gas accidents kill a full order of magnitude more members of the public than nuclear accidents. The same study found that pollution from natural gas kills 54 times more and injures 136 times more people than from nuclear.¹⁵

Using standard public health accounting, closing DCP would result in 831 to 5,637 premature deaths. Using the same calculations, Diablo Canyon has prevented up to 14,421 deaths since it began producing electricity. That's because using nuclear energy instead of coal and natural gas saves lives. In a study for the journal *Environmental Science and Technology*, climate scientist James Hansen and Pushker Kharecha in 2013 calculated that nuclear energy has prevented 1.8 million deaths since 1971.¹⁶

¹⁴ Sudhin Thanawala, "California Utility Guilty of Obstructing Investigators," *AP*, August 10, 2016.

¹⁵ Anil Markandya and Paul Wilkinson, "Electricity and Health," *Lancet*, September 15, 2007

¹⁶ Kharecha and Hansen, "Prevented Mortality and Greenhouse Gas Emissions from Historical and Projected Nuclear Power," *Environmental Science and Technology*, 2013

9. PG&E’s Application rests on its false claim that DCPD will require cooling towers or some other very expensive OTC requirement.

PG&E forecasts in its Prepared Testimony that in 2025 Diablo’s revenue requirements will be \$1.661 billion, rising to \$1.743 billion in 2030, on a total output of 16,300 GWh per year. Neither PG&E’s Application nor its Testimony breakdown or explicitly justify 60 percent inflation in DCPD’s costs.

In its Application, PG&E rests the \$1.6 billion in revenue requirements on assumption that “the cost to operate Diablo Canyon may significantly increase due to [once-through-cooling regulatory requirement].” It adds:

Future operating costs are uncertain due to a variety of regulatory and other factors and could increase as the facility ages. Compliance with California’s environmental protection regulations and other state and federal requirements may increase costs beyond 2025. These include, for example, any environmental mitigation or compliance measures required by California resource agencies, retrofits to comply with the State Water Resources Control Board’s (“SWRCB”) Once-Through Cooling (“OTC”) regulation.

PG&E offers account of OTC is misleading in several ways:

PG&E’s Proposal and Testimony ignore the fact that framework for an OTC mitigation settlement was already negotiated and focused on land conservation and artificial reef.

In 2000, the Central Coast Regional Water Quality Board created the framework for an OTC settlement with PG&E. Michael Thomas from Board oversaw the process, and hired Peter Raimundi from UC-Santa Cruz who worked with PG&E consultant John Steinbeck of Tenera Consultants. In January 2016, all three men were interviewed by Michael Shellenberger and the transcripts of the interviews are attached as an appendix.

The Regional Water Board — not the *State* Water Board, as PG&E claims — decides on OTC compliance. Explained Michael Thomas of the Central Coast

Regional Water Quality Board: “Both boards have a role, **but the Regional Water is who decides whether to adopt cooling towers.**” Indeed, as we’ll note below, the State has deferred to Raimondi, Thomas and Steinbeck.

The artificial reef was proposed at one-time cost of \$15 - \$50 million. According to Raimondi’s presentation to the State Water Board, and based on research with Steinbeck and Thomas, “An artificial reef of sufficient size and with appropriate design and placement could compensate for the majority of impacts associated with entrainment at DCPD....The estimated cost for the construction of an artificial reef ranged from 15 million to 50 million dollars.”¹⁷

Raimondi (2016):

“We proposed compensatory mitigation through habitat creation. Most species affected were ones associated with rocky subtidal reefs. So we proposed they build artificial reefs. There was precedent in southern California where for SONGS a compensatory reef was built and is still operating.... **The cost of the construction of the San Onofre artificial reef was \$30 to \$35 million, and that’s close to the estimate from Diablo.**”

The negotiated settlement focused on land conservation. Said Thomas, “We came up with a package that comprised several million in projects and the setting aside about 2,000 acres of land north of the power plant in a conservation easement.”

The cost of land conservation was estimated at \$4.3 million per year.

According to Thomas:

For Diablo, if you go through the calculations, OTC compliance comes out to \$4.3 million per year, for 2.5B gallons a day. PG&E can pay the \$4 million per year. The State Water Board preference is that that the money goes toward supporting and implementing the marine protected areas. So if you establish marine protected areas, it would help make up for losses by the power plant

¹⁷ Peter Raimondi, “The Science of Mitigation: Based on work done with Michael Thomas, Greg Cailliet and John Steinbeck and many others,” 2008. Submitted to the State Water Quality Board.

When we did it with PG&E it was several million plus the land. **They could pay \$4.3 million a year, or they could propose something else.** What they propose is pretty wide open. They could say they've already taken mitigation measures that should be taken into account. There's only one case where a power company has done that, and it was approved. I would expect PG&E to document everything they have done that they could consider beneficial to environment and make that as compelling as possible.

All the parties rejected cooling towers, including the Water Board. Said Thomas, "I don't think they are feasible or optimal. There have been multiple studies for towers that aren't feasible. We hired our own consultants separate from PG&E and they came to same conclusion."

Said PG&E's consultant Steinbeck:

"PG&E may make the decision to shut Diablo Canyon down but under existing state regulation they can continue to operate without building cooling towers. PG&E just needs the Board to make decision that we're going to do this or that and then come up with a proposal and then they're going to move forward with that. I don't understand why PG&E is so concerned."

- a. **PG&E falsely claims that DCP's compliance with OTC would require a longer outage.**

PG&E in its Testimony writes:

As part of its OTC mitigation compliance, it is assumed that DCP would transition from the historical maintenance schedule to an annual two-month spring outage schedule with refueling occurring every other year. This two-month outage schedule in the spring would also help to mitigate over-generation events. Based on this two-month annual outage schedule, post-2025 generation from Diablo Canyon is projected to decline from historical levels to 16,300 GWh.

But “longer outage” was never included in mitigation framework proposed to the Regional Water Quality Board. PG&E cites no evidence for this claim and instead cites a dead web link: “Error: 404 – The page you requested could not be found.” on the State Water Resource Control Agency web site.

b. PG&E Exaggerates OTC Compliance by at least \$600 million annually.

The Highest estimate named for mitigation was \$50 million *total* for an artificial reef. The parties (State and PG&E) were not far from each other in total cost. Said Raimondi:

“I can’t remember exact figures but the ballpark was a \$20 - \$30 million difference between the two mitigation proposals. Ours was something like \$35 million and theirs was like \$5 million.”

PG&E’s estimates for Diablo’s revenue requirements and unit costs per megawatt-hour are way out of line with estimates made by other experts, with Diablo cost data itself and with other PG&E estimates.

Other estimates of Diablo’s revenue requirements in the coming decade are much lower than PG&E’s Testimony figures. A recent study by V. John White and Associates for Friends of the Earth estimated that Diablo’s revenue requirement in 2025 would be between \$1.003 billion and \$1.069 billion, far lower than PG&E’s \$1.661 billion.¹⁸ A 2015 estimate submitted to the CPUC by John Geesman, an attorney for the Alliance for Nuclear Responsibility, put the 2019 revenue requirement of the plant at \$1.02 billion.¹⁹ A 2013 report funded by PG&E also estimated that Diablo’s revenue in 2027 would be about \$1 billion. All these

¹⁸ V. John White and Associates, “A Cost Effective and Reliable Zero Carbon Replacement Strategy for Diablo Canyon Power Plant;” p. 37. http://lowcarbongrid2030.org/wp-content/uploads/2016/PDFs/160627_Diablo-Final-Report.pdf

¹⁹ Public Utilities Commission of the State of California, “Prepared Direct Testimony of John L. Geesman on Behalf of The Alliance for Nuclear Responsibility in Application No. 15-09-001 Pacific Gas and Electric Company Test Year 2017 General Rate Case,” p. 16. <http://a4nr.org/wp-content/uploads/2016/03/A1509001-A4NR-Geesman-Ratemaking.pdf>

estimate converge on a probable Diablo revenue requirement of about \$1 billion in the 2025 to 2030 period, about \$700 million lower than PG&E's forecast. **(PG&E Testimony, p. 8-AtchA-51)**

Current cost figures for Diablo Canyon support these estimates. PG&E data on Diablo submitted in its General Rate Case showed total operating and capital expenses of \$627 million for the plant in 2015,²⁰ about \$36 per MWh, which accords well with industry averages. Adding an 11.8 percent return on the plant's \$1.805 billion net value **(PG&E Testimony, p. 10-5)** would give a total revenue requirement of \$840 million in 2015, for a unit cost of \$48 per MWh. To reach PG&E's Testimony cost figures, Diablo's revenue requirement and unit costs would have to double over the next 10 years. This forecast is drastically out of line with the estimates cited above that indicate a revenue requirement in 2025 of about \$1 billion, or \$57 per MWh.

Since PG&E's case for closing Diablo Canyon relies on these erroneous and unfounded cost estimates, the closure proposal should be rejected by the CPUC.

10. Even with its inflated future costs, DCPD would still be cheaper than replacing it with other low-carbon power sources.

PG&E's inflated cost forecasts show that in 2025 Diablo's revenue requirements would be \$1.661 billion, rising to \$1.743 billion in 2030, on a total output of 16,300 GWh per year. **(PG&E Testimony, Table 2-6)** That puts the average unit cost of the power at \$102 per megawatt-hour (MWh) in 2025, rising to \$107 per MWh in 2030. PG&E's estimate of the cost of renewable resources to replace Diablo is \$103 per MWh in 2025, rising to \$113 per MWh in 2030 **(PG&E Testimony, pp. 3-9 to 3-10)**.

²⁰ Public Utilities Commission of the State of California, "Pacific Gas and Electric Company 2017 General Rate Case Exhibit (PG&E-1) Summary of PG&E's 2017 General Rate Case Supplemental Workpapers Supporting Chapter 1." pp. B5-1 to B5-6.

Thus, PG&E's numbers still show Diablo with a slight cost advantage over RE sources, and give no support to a financial case for closing Diablo.

PG&E's estimates of the cost of renewable energy ("RE") resources are too low. PGE assumes a RE resource mix to replace Diablo of 80 percent wind and 20 percent utility-scale solar. This is very different from California's actual RE mix, which has a much higher proportion of higher-cost solar in relation to lower-cost wind. In 2015 the utility-scale intermittent energy mix in California was 45 percent wind to 55 percent solar,²¹ vastly different from the 80:20 wind to solar mix PG&E assumes, and solar power is growing much faster than wind power. The skewed resource mix that PG&E assumes underestimates the likely costs of RE power and ignores the greater likelihood of curtailment in a mix with a higher proportion of solar.

PG&E's estimated RE costs also factored in the federal and state subsidies RE will receive. Without the subsidies, the RE costs would be substantially higher. Federal subsidies are due to sunset by 2025, making subsidy assumptions uncertain.

Once outlandish and unfounded assumptions about OTC mitigation and cooling towers are replaced with realistic cost estimates, continued operation of Diablo is seen to be much cheaper than replacing it with renewable sources, with a cost in the neighborhood of \$57 per MWh range in the post-2025 period. That is about half the cost of PG&E's estimate of the cost of replacing it with renewables and energy efficiency. It's also about the same as the price PG&E estimates that Diablo's surplus power would sell for on wholesale markets. PG&E's bundled customers would therefore pay the same low average cost as other wholesale customers would pay, a cost below what they would pay for low-carbon replacement resources

²¹ U. S. Energy Information Administration, Electricity Data Browser, <http://www.eia.gov/electricity/data/browser/#/topic/0?agg=2,0,1&fuel=vtvv&geo=000000000004&sec=g&linechart=ELEC.GEN.ALL-CA-99.A&columnchart=ELEC.GEN.ALL-CA-99.A&map=ELEC.GEN.ALL-CA-99.A&freq=A&ctype=linechart<ype=pin&rtype=s&pin=&rse=0&mptype=0>

according to PG&E's estimates. Relicensing of the plant and operating it until 2045 is thus the most economical option both for its bundled customers and for other consumers in the PG&E service territory and the larger CAISO grid. Allowing the closure to proceed would mean needless rate increases for PG&E's bundled customers and other California ratepayers.

The cost issue is central to the case for closing Diablo Canyon. PG&E has no duty to close the plant simply because some of its power is surplus to its bundled load when it can sell the surplus to the larger grid. Nor does it have a duty to close the plant in order to prevent a trivial degree of curtailment of renewable generation when that curtailment is actually caused by chaotic overproduction from renewable generators themselves. It does have a fiduciary duty to minimize costs for its customers. A realistic cost forecast for the plant would show that continuing to operate it will fulfill that obligation—and PG&E's case for closing Diablo Canyon would collapse

CONCLUSION

An independent CPUC committed to its mission — defending the public interest — should recognize its duties go well beyond those of PG&E. It would consider the impact of closure on the success of California’s emissions-reduction initiatives. It would consider the balance of impacts on the state’s air quality, land uses and environment. It would consider the impact on all the state’s rate-payers in the PG&E service territory and on the larger grid, not just the rate-payers in PG&E’s bundled customer base.

An independent CPUC would carefully weigh these considerations and find that keeping Diablo open accords best with the interests of Californians and the qualities of efficiency and sustainability that the state wants in its energy supply.

Therefore, EP opposes the Joint Proposal.

Respectfully submitted September 15, 2016.

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APPENDIX

- Interview with Michael Thomas, Assistant Executive Officer, Central Coast Regional Water Quality Control Board, interviewed January 12, 2016
- Interview of Pete Raimondi, expert consultant to regional water board. Professor at UC-Santa Cruz ecology and evolutionary biology, interviewed January 8, 2016
- Interview with John Steinbeck, Tenera Consultants, January 8, 2016

Michael Thomas, Assistant Executive Officer, Central Coast Regional Water Quality Control Board; Interviewed by Michael Shellenberger; 3:45 pm January 12, 2016.

Who are you what is your role here?

I am the Assistant Executive Officer and the head of our enforcement unit. Almost all of the enforcement actions go through me. I was the lead staff person in 2000 and worked with Pete Raimondi, and hired him to assist us. And I worked with PG&E's consultant John Steinbeck. Pete's a great guy and a great scientist, John is also really good.

Where is the whole process at?

Back then we did all the environmental studies and there were two issues. What gets sucked in — entrainment — and the discharge of water 22 degrees above background levels.

In Regional Water Board staff's opinion, there were only significant environmental impacts from entrainment, and for PG&E to renew its permit, we said they had to address them.

So we came up with proposal for regional board to settle all of those impacts. We came up with a package that comprised several million in projects and the setting aside about 2,000 acres of land north of the power plant in a conservation easement.

The Board in 2000 and again in 2003 did not accept the settlement, and at the same time EPA decided that they were going to revise their Clean Water Act 3060b regulations that govern intake, entrainment and impingement. The EPA set out to advise and that put us on hold. EPA finally revised and adopted the the new regulations. But then the State Water board in Sacramento decided to adopt their own policy, and that took several years.

So now we're back to renewing a discharge permit for Diablo and we have to look at all those issues again. We have to look at the work we did previously, and the work we did since, and come up with a proposal for settling all the issues.

When will the process be finished?

We want to bring a proposal to the board in January 2017 to revise the permit

What will you do between now and then?

We have to revise the draft, update the draft, and work with the State Water Board because the state has some authority over the mitigation of impacts from OTC policy.

How did feds change rules and how did state change theirs?

I think the Feds basically affirmed their rule — which was very controversial — that the power companies have to do everything to minimize impacts, including imposing closed cycle cooling where it's feasible to do so

California State decided similarly. There are categories for different plants and nuclear has its own category. Nuclear has extra time for studies and analyses for minimizing impacts and deciding whether it's feasible.

Are cooling towers feasible?

I don't think they are feasible or optimal. There have been multiple studies for towers that aren't feasible. We hired our own consultants separate from PG&E and they came to same conclusion. We did a lot of work but the State Water Board put together their own review panel and looked at all these issues again after we did.

Will the Regional Board or State Board decide?

Both boards have a role, but the Regional Water is who decides whether to adopt cooling towers. On entrainment and impingement we will work with State Water Board executive director Tom Howard.

What is the main issue?

Entrainment is a significant issue because the volume of water is 2.5 billion gallons per day. We estimated larvae and our position was it is a potentially significant impact and so some level of mitigation is needed. How do you quantify that? It's extremely difficult because you're dealing with larvae — how do you put a price on that? And how do you mitigate for it? Do you do off-shore reefs, wetlands? And how much? They did that at San Onofre and it's very controversial as to what to do about it and how much to do about it. You have scientists on both sides. Some say you should do a substantial amount of it and others say it's relatively insignificant.

Have you found any change to fish populations over time?

No we haven't. The problem is that fish populations go up and down dramatically and there's so much data you can't determine cause and effect like from a power plant.

So we just assume that there is an impact and err on the conservative side.

What are the factors?

There are many factors including seasonal warming, El Nino, warming from the blob, climate change, and just the general warming of the ocean — plus fishing. We have fishing pressure all along the central coast, and now we have marine protected areas. There's one to the north of Diablo canyon, so you have all of these things acting on the fish population.

Is the pretense that science? Or do other things come in to play?

Both. A State panel recommended to the state board that power plants pay a fee. They looked at the data and converted entrainment losses into habitat. They asked how much habitat would it take to create the loss by power plant. You do that conversion and you ask how much is that worse. And they simplified and now we can look at volume of water by power plant and we can convert to acres and dollars.

How much money would it likely cost if PG&E paid by volume of water?

For Diablo, if you go through the calculations, OTC comes out to \$4.3 million per year, for 2.5B gallons a day. PG&E can pay the \$4 million per year. The State Water Board preference is that that the money goes toward supporting and implementing the marine protected areas. So if you establish marine protected areas, it would help make up for losses by the power plant.

Could Water Board staff make such a proposal for mitigation?

Yes. I anticipate we'll be talking to PG&E about exactly that. Asking them what they propose. Policy allows PG&E to propose option. They can say we have already done x, y, and z environmental projects and we want that to be accepted as mitigation. There's a power plant that just did that a few months ago.

Is it even likely you'd come back with something as small as \$4 million a year?

Well, if it operates 10 years, that's \$40 million. If it operates 20 years, that's \$80 million.

Is that your ballpark estimate?

I don't know. When we did it with PG&E it was several million plus the land. Now we have to bring into context today's State Water Board policy to minimize entrainment and impingement to level of cool water or something else. They could pay \$4.3 million a year, or they could propose something else. What they propose is pretty wide open.

They could say they've already taken mitigation measures that should be taken into account. There's only one case where a power company has done that, and it was approved.

I would expect PG&E to document everything they have done that they could consider beneficial to environment and make that as compelling as possible.

Why is everyone asking whether plant can survive?

Good question. The other thing is the re-licensing with the Public Utilities Commission and the Coastal Commission. They need to get a renewal for extending their license.

Couldn't the Regional Water board still decide to make PG&E build towers?

Our staff's opinion is based on the review of the evidence which is that cooling towers are not feasible. There are organizations that disagree with us and they will be present and involved and will

argue that we should not permit. But I want to clarify that board makes its own decisions.

When will the board vote?

Depends. If it's not controversial, they may decide in one meeting. But controversial topics might take several meetings, and board meetings are several times each year. We could be dealing with it for the first part of next year.

Interview of Pete Raimondi, Professor at UC-SC ecology and evolutionary biology; Interviewed by Michael Shellenberger at 1:30 pm on January 8, 2016.

Can you help me understand who are you and your role here?

I work for the State of California, the California Coastal Commission, the California Energy Commission, and the Regional Water Board for assessments of power plants, desalination plants, and for designing mitigation.

The State Regional Water Quality Control Board is the regional group that administers the State Water Board's [National Environmental Policy Act's] NEPA determinations, 316a and 316b. The first, 316a is thermal effects, and 316b is intake effects. I typically do intake effects.

The State convened two technical working groups in the 1990s on thermal and entrainment. Both came up with results.

I'll only tell you about intake. We were charged with working with consultants hired by PG&E to come up with independent assessments. The State people would address questions of interest to intake impacts under 316b.

We had agreement with PG&E that we would have oversight of assessment. [PG&E's consultant] Tenera did a great study. There was no difference of opinion over the design or the results or the math. But there was a difference over whether there was an impact and, if so, its magnitude, and how much it should be. [PG&E

and Tenera] proposed a mitigation package that I thought was not enough to compensate for the losses found in study.

But before anything happened, PG&E declared bankruptcy. So it stalled because PG&E declared bankruptcy. So that stopped progressing.

What was the mitigation PG&E proposed?

They proposed a whole bunch of things for mitigation. We came up with a counter package for intake. They proposed a package for thermal and intake. We proposed a suitable mitigation for intake.

We proposed to use information collected to come up with a loss to the biology. The mitigation intent was to provide those resources, to have “complete compensation,” as we call it. The key word is “compensatory” mitigation.

In this situation we proposed compensatory mitigation through habitat creation. Most species affected were ones associated with rocky subtidal reefs. So we proposed they build artificial reefs. There was precedent in southern California for SONGS where a compensatory reef was built and is still operating.

How much would your package have cost?

I can't remember exact figures but the ballpark was a \$20 - \$30 million difference between the two mitigation proposals. Ours was something like \$35 million and theirs was like \$5 million.

Is building an artificial reef much more than dumping rocks on a sandy beach?

It's a little harder than that. You have to have a particular sand, otherwise the whole reef will sink. The cost of the construction of the San Onofre artificial reef was \$30 to \$35 million, and that's close to the estimate from Diablo.

Isn't 30 million a bargain mitigation for once-through cooling?

I agree. When [utility] staff analysts look at it next to net operating profits, it's typically not noticeable on the ledger. It's a fraction of all the other costs going on. At the time PG&E was suffering for reasons that didn't have to do with mitigation and ultimately filed for bankruptcy. At the time they made the reasonable claim they couldn't afford. But the idea was that something would happen, and it didn't.

Why?

I don't know. The State just dropped. Coming out of that period we went through high growth in the State and there were brownouts and everyone was worried about the plants going off line. A huge amount of the electricity was in the two nukes [San Onofre and Diablo Canyon] at the time and they worried about brown-outs.

John Steinbeck, Tenera, Interviewed by Michael Shellenberger; 3:21 pm
January 8, 2016

You worked for PG&E to evaluate how to handle its once-through cooling. How long have you been working on this?

I've been out there for 30 years. I wrote the report that me and [UC-Santa Cruz professor and Water Board Consultant] Pete [Raimundi] were coauthor on that became the guidelines. All of these intake assessments have to use our approach. Pete and I are friends but we're on opposite sides. But we have a lot of respect for each other.

Is it true the State Water Board is likely to require PG&E build cooling towers at Diablo Canyon?

There's a large misconception of what the State did with [the Federal Clean Water Act's] once-through cooling [OTC] requirement. I keep seeing wrong stuff in print. The State did not make OTC illegal or stop the use of OTC. Plants can still use OTC, they just have to initiate some kind of useful measures, operational or technological, to reduce the effects of OTC. [Natural gas power plant] Moss Landing has an agreement with state on

how they're going to do that. The other carve-out was nuclear plants. The State recognized that they couldn't go in and jeopardize nuclear safety. So, the State was going to require Diablo to do a lot of work, but I am assuming they're going to do mitigation since it doesn't make sense to try to retrofit the plant.

Why then is PG&E saying it might shut Diablo down?

PG&E may make the decision to shut Diablo Canyon down but under existing state regulation they can continue to operate without building cooling towers. PG&E just needs the Board to make decision that we're going to do this or that and then come up with a proposal and then they're going to move forward with that. I don't understand why PG&E is so concerned.

How much could mitigation cost PG&E?

Mitigation may cost them \$200 million. That's what [closed nuclear plant] San Onofre shelled out to the Coastal Commission [to build an artificial reef]. Maybe it goes up to \$300 million. Whatever it is, it will be a lot less than billions.

How then did the conversation ever even get to \$6 billion cooling towers?

[California Environmental Quality Act] CEQA required the study as part of the regulations. CEQA required PG&E to look at all options to reduce the effects of OTC that was reasonable and cost effective and didn't threaten safety. But CEQA never required PG&E to get rid of OTC, just to look at the options from a realistic standpoint, select an option, and get it approved.