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*Comment Received From: Californians for Green Nuclear Power, Inc.
Submitted On: 10/11/2023
Docket Number: 21-ESR-01*

CGNP's October 5, 2023 Comments in 21-ESR-01

Please see CGNP's attached Comments in CPUC Proceeding R.23-01-007 dated October 5, 2023 Regarding the CEC Draft Cost Comparison

Additional submitted attachment is included below.



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

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R2301007

Implementing Senate Bill 846
Concerning Potential Extension of
Diablo Canyon Power Plant
Operations

Rulemaking 23-01-007
(Filed January 12, 2023)

**CALIFORNIANS FOR GREEN NUCLEAR POWER'S
PHASE 1, TRACK 2 COMMENTS REGARDING THE CEC'S
SEPTEMBER 26, 2023 DRAFT COST COMPARISON**

October 4, 2023

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

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I. VERIFICATION

The author below affirms under penalty of perjury that the information contained in this written testimony is true and correct, and is given in good faith to their best available knowledge, subject to modifications resulting from new findings.

/s/ Gene A. Nelson, Ph.D., President and Senior Legal Researcher

October 4, 2023

II. INTRODUCTION AND SUMMARY

Californians for Green Nuclear Power (CGNP) respectfully submits these comments in response to the Administrative Law Judge's (ALJ's) Ruling filed on September 21, 2023 regarding the CEC's Draft Senate Bill 846 Diablo Canyon Power Plant Extension Cost Comparison, (CEC Draft Cost Comparison) which was issued on September 26, 2023.¹ CGNP extracted statistics from the CEC Draft Cost Comparison which establishes DCPD produces power for **about \$40.00 / MWh (or 4 cents / kWh) for the period from 2023 - 2030**, based on the plant's nominal annual production of 18 TWh / year. (A TWh is a billion kWh.) This spreadsheet appears in the following section. CGNP establishes the significant economic value of DCPD's safe, abundant power in the subsequent section. CGNP raises concerns regarding the reliability, safety, and cost-effectiveness of virtual power plants (VPPs) in the next section. CGNP concludes with a discussion regarding the lack of cost-effective clean-firm replacements for DCPD. CGNP holds there are structural problems within the Commission causing conflicts of interest.

CGNP is an all-volunteer non-profit association of scientists, educated at top universities, considered to be specialists in their fields, each with decades of experience in energy, nuclear power, and environmentalism. CGNP's experts became involved before the Commission because they wish to help California make wise decisions for the benefit of future generations.

¹ <https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M520/K484/520484417.PDF>

III. COMMENTS - A. DCP's POWER IS REASONABLY - PRICED AT ABOUT 4 CENTS / kWh.

10/3/2023

R2301007 CEC DCP Cost per kWh 09 26 23.xls

Gene Nelson, Ph.D.

\$	735,800,000.00	2023 Cost
\$	744,400,000.00	2024 Cost
\$	893,100,000.00	2025 Cost
<hr/>		
\$	2,373,300,000.00	Total Cost - Page 17 costs
\$	2,373,000,000.00	DCPP 2023-2035 Costs
	54,000,000,000	3 year DCP generation, kWh
\$	0.0439	DCPP Cost/kWh 2023-2025

From pages 8 and 9 of CEC DCP Cost Estimate 09/26/23

Table 7 - Page 17 PG&E Future Costs

\$765,100,000.00	2026
\$752,000,000.00	2027
\$885,800,000.00	2028
\$773,500,000.00	2029
\$422,600,000.00	2030
<hr/>	
\$3,599,000,000.00	Total

5 year projected generation

90,000,000,000 kWh

\$ 0.0400 DCP Cost/kWh 2026-2030

Table 8: DCP CAPEX and OPEX Values for SB 846 Analysis, in Millions of Dollars

Cost Component	2023	2024	2025
Capital Expenditures (CAPEX)	150.2	150.0	150.1
Operating Expenditures (OPEX) and Fuel	585.6	594.4	743.0
Total	735.8	744.4	893.1

Matches page 17 costs

SB846 Loan by year

\$	42,000,000.00	2022
\$	381,000,000.00	2023
\$	408,000,000.00	2024
\$	210,000,000.00	2025
\$	58,000,000.00	2026
<hr/>		
\$	1,099,000,000.00	Total from \$1.4 billion State Loan

III. COMMENTS - B. ECONOMIC VALUE OF RELIABILITY

CGNP's comments assert that extending Diablo Canyon Power Plant's (DCPP's) operations as long as possible is the just and reasonable, prudent decision for the Commission. And that any analysis of cost is inextricably linked to reliability and the harms from anthropogenic carbon emissions.

CGNP's primary concern is the CEC Draft Cost Comparison fails to recognize DCPP's economical power production or the economic value of continued DCPP operations. SB 846 was enacted by the California legislature and Governor as a result of increasing concerns regarding California grid reliability if DCPP were retired. There are California ratepayer costs associated with an unreliable power grid. As an example, there were adverse economic consequences of the poorly-designed and implemented set of grid deregulation policies popularly known as the 2000 - 2001 ENRON power crisis. Lost productivity was a significant adverse economic consequence of an unreliable California power grid. ENRON created power shortages in California with highly-profitable energy arbitrage schemes.² One estimate was economic losses associated with lost productivity were between \$200 billion to \$400 billion.³

Lawrence Berkeley National Laboratory (LBNL) has a longstanding interest in electric power grid reliability. The 2018 report is one of their recent

² ENRON employed energy arbitrage schemes with names like "Fat Boy," "Death Star," and "Ricochet." Robert Bryce, *Pipe Dreams: Greed, Ego, and the Death of Enron* (New York: Public Affairs, 2002), and Emmet Penney, "The Rise and Fall of the American Electric Grid," *American Affairs* 6, no. 3 (Fall 2022): 56–79, and Emmet Penny, "Enron after All: A History of Our Broken Energy Paradigm," *American Affairs* Volume VII, Number 1 (Spring 2023): 17–45.
<https://americanaffairsjournal.org/2023/02/enron-after-all-a-history-of-our-broken-energy-paradigm/>

³ <https://energycentral.com/c/gn/us-renewables-expand-nukes-don%E2%80%99t> See Gene Nelson, Ph.D.'s July 5, 2022 comment.

publications.⁴ The LBNL - Nexant team released their Interruption Cost Estimator (ICE) tool in 2018. <https://icecalculator.com/documentation> Utilizing the default values contained in the tool for the state of California yields an average of *only two hours of electric service interruptions each year* with a cost to the state of \$7,551,543,130 (\$7.55 billion dollars,) with most of the economic losses with medium and large corporate and industrial customers. The ICE tool values are consistent with the lost productivity estimate shown in the previous paragraph.

Reliability Inputs:

SAIFI	2.000
SAIDI	120.0
CAIDI	60.0

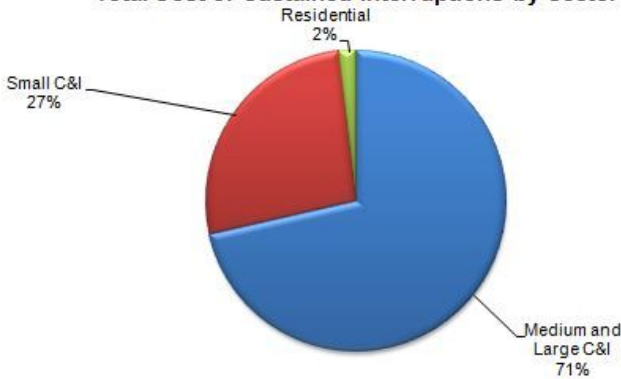
Number of Customers:

Non-Residential	1,886,984
Residential	12,971,924

Main Output:

Sector	No. of Customers	Cost Per Event (2016\$)	Cost Per Average kW (2016\$)	Cost Per Unserved kWh (2016\$)	Total Cost of Sustained Interruptions (2016\$)
Medium and Large C&I	319,434	\$8,444.8	\$161.2	\$161.2	\$5,395,094,628.4
Small C&I	1,567,550	\$643.6	\$311.5	\$311.5	\$2,017,882,768.3
Residential	12,971,924	\$5.3	\$6.5	\$6.5	\$138,565,733.4
All Customers	14,858,908	\$254.1	\$123.2	\$123.2	\$7,551,543,130.1

Total Cost of Sustained Interruptions by Sector



SAIFI System Average Interruption Frequency Index, 2 interruptions / customer per year
 SAIDI System Average Interruption Duration Index, 120 minutes / year = 99.977% availability
 CAIDI Customer Average Interruption Duration Index = SAIDI / SAIFI

⁴ Estimating Power System Interruption Costs: A Guidebook for Electric Utilities
 Prepared for the Office of Electricity Transmission Permitting and Technical Assistance Division
 U.S. Department of Energy Principal Authors
 Michael Sullivan, Myles T. Collins, Josh Schellenberg - Nexant, Inc.
 Peter H. Larsen - Lawrence Berkeley National Laboratory
https://eta-publications.lbl.gov/sites/default/files/interruption_cost_estimate_guidebook_final2_9july2018.pdf

In conjunction with the above LLBL - Nexant team's work, they published an update document.⁵ This document shows the economic productivity per unit of electricity for California was \$15.60 / kWh in 2018. **Since DCPD typically generates 18 TWh (18 billion kWh,) the plant supports \$280.8 billion in annual productivity. This is an extremely important DCPD economic benefit connected with DCPD's reliability that is completely ignored in the CEC's Draft Cost Comparison.**

III C. WEAKNESSES IN CEC'S VPP PROPOSAL

Virtual Power Plants (VPPs) remain largely a "paper construct". However, it is certain that they are based on distributed inverter - based generation. As such, in contrast to DCPD, they are incapable of providing inertial support to the California grid. Inertial support stabilizes the grid against the random destabilizations associated with the large amounts of nondispatchable generation on the California power grid. VPPs are based on the joint actions of individual owners of batteries and the corporate aggregation entities. Here are some incisive comments that a respondent posted after I posted a link to the CEC draft Cost Comparison.⁶

The VPP concept is unproven at scale. National Grid has greatly exaggerated the outcomes of their DFS (Demand Flexibility Service) paying consumers to have power cuts initiative. In reality the savings were very small, and to a significant

⁵ Changes to the Underlying Econometric Models for the Interruption Cost Estimate (ICE) Calculator, Josh Schellenberg (Nexant, Inc.) and Peter Larsen (Berkeley Lab)
https://eta-publications.lbl.gov/sites/default/files/ice_calculator_recent_updates.pdf

⁶ "Thank You," David Turver Substack, September 30, 2023.
<https://davidturver.substack.com/p/thank-you-for-subscribing-to-eigen-values/comments#comment-41073122>

extent illusory, because consumers gamed the system by increasing usage during reference periods so that their apparent saving was greater than it really was.

V2G (Vehicle to Grid) requires a significant incentive to secure participation, and experience is not long enough for consumers to be able to gauge whether the incentive is sufficient compensation for battery degradation through extra cycling.

Nevertheless, National Grid are probably world leaders in testing the technologies used in VPPs so it is worth checking out their projects for bits that work and pitfalls they have still to handle.

Other researchers have identified cybersecurity concerns for VPPs. In contrast to reliable DCP's operations being securely "air gapped" - isolated from the internet - in accord with critical infrastructure protection (CIP) principles, the VPP attack surface for malicious actors would extend to each and every of likely tens of thousands of customers. Once one customer was compromised by malware or ransomware, there is a potential for every customer, the aggregator, and the served utilities to all be compromised.^{7 8} Here are selected presentation slides showing cyberattacks on power grids similar to those expected against VPPs. Note the 2019 ransomware attack against Colonial Pipeline is the last example on Trevizan's second slide on the next page.

⁷ "Cybersecurity of Battery Energy Storage Systems" Rodrigo D. Trevizan, Ph.D, Senior Member of Technical Staff, Sandia National Laboratories, 2021. <https://www.osti.gov/servlets/purl/1855330>

⁸ "California and FERC Order 2222 – A Case Study on What We Might Expect" HSI Blog, Frisco, Texas. <https://hsi.com/blog/california-and-ferc-order-2222-a-case-study-on-what-we-might-expect>

Notable Cyberattacks

- 2010 – Natanz Uranium Enrichment Plant, Iran
 - Stuxnet
 - Targeted Programmable Logic Controllers (PLCs)
 - Attacked centrifuges used for Uranium enrichment
- 2015 – Ukraine
 - Access through spear-phishing emails and malware in MS Office files
 - Remotely disconnected 7 110kV and 23 35kV substations
 - 1 to 6-hour outages affecting 225,000 customers
 - Denial-of-service



Ukrainian *oblasts* affected during the 2015 cyberattack.



Notable Cyberattacks

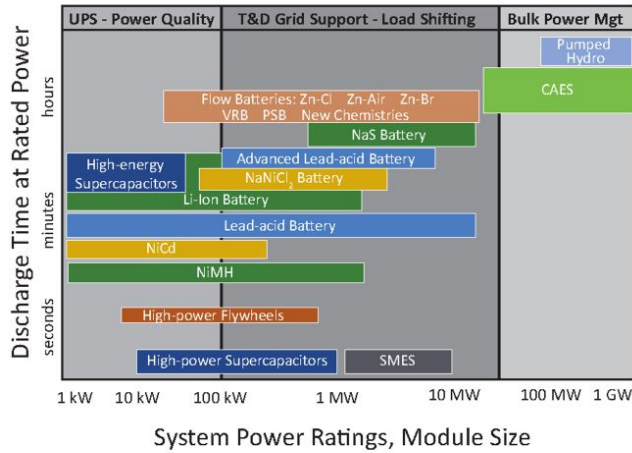
- 2016 – Ukraine
 - Industroyer/Crashoverride malware framework
 - More sophisticated than 2015 attack but less successful
 - Attack on transmission station led to 1-hour outage in Kiev region
 - Goal was to permanently damage grid equipment following switch to manual
- 2018 – Intrusion in control rooms of US power utilities
 - Believed to be part of a reconnaissance operation
- 2019 – First Cyberattack on Wind and Solar in the US
 - Denial-of-service
 - Unpatched firewall vulnerability
- 2019 – Ransomware attack on Natural Gas Pipeline in US
 - Halted operations of a natural gas compression facility for 2 days
 - Spear-phishing attack
 - Attacker accessed Operational Technology network following Information Technology intrusion



The Battery Energy Storage System (BESS) assets shown below in the third slide from the Trevizan's presentation would be vulnerable in a VPP cyberattack. Shorting out a BESS battery via malicious actions would likely cause

a difficult - to - extinguish fire. Unfortunately, the term "cybersecurity" is absent from the CEC draft Cost Comparison.

Overview of BESS



Source: DOE/EPRI Electricity Storage Handbook in Collaboration with NRECA, 2013



As a consequence of the profit motive and the inherent complexity, VPP aggregators could create artificial scarcity (akin to ENRON's actions in 2000 - 2001) which would be difficult to uncover. For the totality of the concerns raised in this section, VPPs are unlikely to replace DCPP.

III D. NO COST-EFFECTIVE CLEAN FIRM ALTERNATIVES TO DCP

The CEC Draft Cost Comparison shows the lack of alternatives to DCP for supplying safe, abundant, cost-effective (i.e. less than \$40.00 / MWh), dispatchable, emission-free incremental power (clean firm power) to the California power grid. In 2011, the CEC asked the eminent scientists and engineers at the California Council for Science and Technology (CCST) similar questions. Two reports and a summary by a Nobel laureate were the result.⁹ Unfortunately, the fact-based CCST reports were not aggressively disseminated.

Instead, myriad "studies" of DCP opponents continue to be promoted to California decision-makers by deep-pocketed special interests. Many of those special interests would derive commercial benefits if DCP prematurely ended operations. Similar conflicts of interest are evident after the San Onofre Nuclear Generating Station (SONGS) was needlessly closed at the end of January, 2012.

⁹ Here are excerpts from a pair of reports commissioned by the California Energy Commission which asked the eminent scientists and engineers at the California Commission on Science and Technology to determine the safest and most cost-effective way to achieve California's emissions goals by 2030. The third reference is a 3 1/2 page summary.

"California's Energy Future: The View to 2050" Release Date: May 24, 2011 | Last Updated Date: February 19, 2015 <https://tinyurl.com/CCST-Nuclear-1>

... Nuclear power can provide constant, reliable emission-free energy with a much lower and more easily met requirement for load balancing. Roughly 30 new nuclear power plants could provide two-thirds of California's electric power in 2050. However, nuclear waste storage remains a significant problem with existing reactor technology, not to mention public concern, especially in the wake of Japan's recent earthquake and tsunami disaster....

"California's Energy Future – Powering California with Nuclear Energy" Release Date: July 1, 2011 | Last Updated Date: February 19, 2015 <https://tinyurl.com/CCST-Nuclear-2>

... Jane C.S. Long, associate director at large for Lawrence Livermore National Laboratory and co-chair of the California's Energy Future study. Population growth and energy demand will eventually force a decision on California's energy strategy, especially with the requirement for drastic reduction in emissions. "By 2050, California's population is expected to rise to 55 million people. That increase, accompanied by economic growth, will likely require a doubling in electricity production, but with virtually no emissions, to meet state goals," says Jane Long. "That is why nuclear power could prove one important option for meeting those strict and necessary standards."...

"CCST Report on Nuclear Power in California's 2050 Energy Mix," Burton Richter, Ph.D. (Nobel Laureate), July 15, 2011,

<https://ccst.us/wp-content/uploads/071511richter.pdf>

This conflict of interest problem is exacerbated by the lack of a CPUC Inspector General ¹⁰ to investigate waste, fraud, and abuse within the Commission's bureaucracy with a \$1.4+ billion annual budget. Quoting from the conclusion of the cited October 10, 2015 *Sacramento Bee* article regarding Governor Brown's vetoes the previous day,Assemblyman Anthony Rendon, who authored three of the bills, said in a statement that he was disappointed by Brown's vetoes. "We need to rebuild the public's trust in their government," the Lakewood Democrat said. "Each and every day dysfunction continues at the CPUC, that trust erodes." Unfortunately, as the Wikipedia article regarding the CPUC observes, such problems persist. ¹¹

¹⁰ "Governor Brown Issues Legislative Update" October 9, 2015.

<https://www.ca.gov/archive/gov39/2015/10/09/news19160/index.html>

The vetoed bills included these six bills passed unanimously in the California Assembly and California Senate:

– AB 825 by Assemblymember Anthony Rendon (D-Lakewood) – Public Utilities Commission Inspector General

– AB 895 by Assemblymember Anthony Rendon (D-Lakewood) – Utility rate refunds: energy crisis litigation: Public Utilities Commission

– AB 1023 by Assemblymember Anthony Rendon (D-Lakewood) – Public Utilities Commission: proceedings: ex parte communications

– SB 18 by Senator Jerry Hill (D-San Mateo) – Public Utilities Commission: outside counsel

– SB 48 by Senator Jerry Hill (D-San Mateo) – Public Utilities Commission.

– SB 660 by Senator Mark Leno (D-San Francisco) – Public Utilities Commission

"Brown vetoes CPUC reform bills - Governor says technical issues made 50 proposals unworkable," by Jeff McDonald, OCT. 9, 2015 6 PM PT, *San Diego Union Tribune*.

<https://www.sandiegouniontribune.com/news/watchdog/sdut-cpuc-reform-bill-vetoes-2015oct09-htlstory.html>

"Jerry Brown rejects changes to California Public Utilities Commission." By Alexei Koseff

Monday, October 2, 2015 Updated October 10, 2015 9:12 AM, *The Sacramento Bee*

<https://www.sacbee.com/news/politics-government/capitol-alert/article38487060.html>

"Governor Brown Vetoes All CPUC Reform Bills," October 13, 2015, *East County Magazine*.

<https://www.eastcountymagazine.org/governor-brown-vetoes-all-cpuc-reform-bills>

¹¹ In 2020, external auditors from Sjoberg Evanshenk Consulting delivered a series of reports commissioned by the CPUC for roughly \$250,000. These reports reaffirmed continued weak budgeting practices and further discovered that approximately \$200 million due from utility companies, including \$50 million past due since 2017, with portions dating back as far as the 1990s. In February 2021,[18] OSAE reaffirmed these findings, in response to a whistle blower complaint by former Executive Director, Alice Stebbins.

[18.] Office of State Audits and Evaluations (OSAE) (February 2021). California Public Utilities Commission: Performance Audit <https://esd.dof.ca.gov/reports/reportPdf/6F87C5B1-FD89-E C11-9136-00505685B5D1/California%20Public%20Utilities%20Commission%20Performance%20Audit%20February%202021> (Report No. 21-8660-028).

IV. CONCLUSION

Based on our experiences since 2016, CGNP is concerned that our straightforward, fact-based pro-DCPP advocacy in A.16-08-006 and the instant Proceeding will be given short shrift by the Commission in preparing their SB 846 analysis due by the end of December, 2023. The 2011 studies requested by the CEC from the esteemed scientists and engineers of the CCST were ignored by the Commission. Cost-effective Diablo Canyon is needed now, and in the foreseeable future by California's large population and its huge business community. DCPP's safe, clean firm nuclear power will be beneficial to California ratepayers and the environment for decades to come.

October 4, 2023

Respectfully submitted,

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In December 2020, Alice Stebbins was dismissed from the position of executive director after allegedly "violating state personnel rules" and misleading "the public by asserting that as much as \$200 million was missing from accounts intended to fund programs for the state's blind". However, "Bay City News Foundation and ProPublica found that Stebbins was right about the missing money"[19]

[19.] Morris, Scott. "She Noticed \$200 Million Missing, Then She Was Fired"

<https://www.propublica.org/article/she-noticed-200-million-missing-then-she-was-fired>. ProPublica. Retrieved December 26, 2020.