Docket No.: A.24-03-018
Date: July 26, 2024
Commissioner: Douglas ALJ: Atamturk
Witness: Rao Konidena

BEFORE THE PUBLIC UTILITIES COMMISSION OF

THE STATE OF CALIFORNIA

Application of Pacific Gas and Electric Company to Recover in Customer Rates the Costs to Support Extended Operation of Diablo Canyon Power Plant from September 1, 2023 through December 31, 2025 and for Approval of Planned Expenditure of 2025 Volumetric Performance Fees (U 39 E)	Application 24-03-018 (Filed March 29, 2024)

OPENING TESTIMONY OF RAO KONIDENA ON BEHALF OF SAN LUIS OBISPO MOTHERS FOR PEACE

(Public Version)

Dated: July 26, 2024

Rao Konidena for SLOMFP
c/o
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VERIFICATION

The statements in the foregoing document are true and correct to the best of my knowledge. The facts presented in the forgoing document are true and correct to the best of my knowledge, and the opinions expressed therein are based on my best professional judgment. I declare under penalty of perjury under the laws of the state of California that the foregoing is true and correct.

Executed on 26/07/2024 in Roseville, Minnesota,

Rao Konidena

Rao Konidena

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I. INTRODUCTION

Q. Please state your name, employer, title, and business address.

A. My name is Rao Konidena. I am the President of Rakon Energy LLC. My business address is 2309 Auerbach St, Roseville, MN, 55113.

Q. On whose behalf are you testifying in this proceeding?

A. I am testifying on behalf of San Luis Obispo Mothers for Peace ("SLOMFP").

Q. Please describe your current position and provide your education and professional experience related to this testimony.

A. I have been an independent energy consultant for the past five years, primarily focusing on wholesale market practices and policy. Before that, I was employed by Midcontinent Independent System Operator ("MISO") from September 2003 through May 2018. I started as an Applications Engineer for Planning, where I ran Loss of Load Expectation ("LOLE") studies used in the Planning Reserve Margin Requirement. I gained familiarity with MISO's Planning Resource Auction and Module E Capacity Tracking (MECT) tool in various roles at MISO. Specifically, in the Resource Forecasting department, I used peak demand and annual energy data from the MECT to run the resource forecasting model called the Electric Generation Expansion Analysis System (EGEAS), which is an Integrated Resource Planning software tool.

Before leaving MISO, my title was Principal Advisor in Transmission Asset Management. In that role, I was part of an internal subject matter expert team providing technical support to the legal team on how MISO should respond to the Federal Energy Regulatory Commission's Order 841, which compensates Electric Storage Resources and the Notice Of Proposed Rulemaking on aggregations of Distributed Energy Resources.

My CV is attached at the end of this testimony.

Q. Please describe the purpose of your testimony.

A. My testimony focuses on three areas: First, I provide a basis for my expertise in forecasting energy market revenues. Second, my testimony shows that PG&E's CAISO market revenue forecasts are likely inflated. Third, I analyze the need for DCPP extended

operations based on the new resource information. Fourth, I provide a summary of my conclusions.

II. BASIS FOR TESTIMONY ON CAISO MARKET REVENUES

Q. Are you familiar with forecasts of purchase and sale transactions of energy in CAISO's wholesale Energy Market?

A. Yes.

Q. How did you acquire your expertise in this field?

A. In my previous job working for the Midcontinent Independent System Operator (MISO), I was responsible for the PowerBase database that was an input to the energy market price forecasting software tool. The Energy Market forecasts are an output of this software tool. These energy market forecasts were utilized to conduct benchmark studies of the MISO market. Additionally, these energy market forecasts were utilized to evaluate the economic benefits of transmission lines in the MISO Transmission Expansion Plan (MTEP). As an independent consultant, I regularly download Energy Market data from ISO websites to answer various client needs.

III. METHODOLOGY FOR CAISO ENERGY MARKET FORECASTS

Q. What are the different methodologies that are used to forecast CAISO energy market revenues?

A. There are different methodologies used to forecast energy market revenues in general. Primarily, I am familiar with the following methodologies:

- Time Series Analysis – In this method, historical energy market revenues are used to forecast energy market revenues. A time series analysis is typically deployed in load forecasting when the load forecast is not complicated with estimates of future technologies such as electric vehicles. But history is not always an accurate predictor of the future when it pertains to the energy market because of several factors, such as variable renewable energy, fluctuating electric demand due to weather and loss of major transmission lines during natural disasters such as hurricanes and wildfires. So, a time series analysis for forecasting energy market revenues is not completely risk-free.

- Statistical Regression Analysis – In this statistical method, the energy market revenue is the dependent variable, and the independent variables are the generating units, the demand, weather and transmission. Statistical regression analysis is also used in load forecasting or to understand simple energy market revenues in a small power system with few generators and demand.
- Monte Carlo Simulations – In this method, hourly simulations are conducted using both statistical and random sampling techniques. This Monte Carlo simulation method is most widely used for forecasting energy market revenues. I discuss this method in more detail below.

Q. Please explain how production cost modeling software is used to forecast CAISO energy market revenues.

A. I am most familiar with PROMOD IV, a production cost modeling software that calculates Locational Marginal Price (LMP). LMP at each location/transmission node in CAISO shows the price of serving the next Megawatt (MW) and includes 3 components – Energy, Congestion and Loss. Hence, in each LMP, there is a price of serving energy, the congestion price and a price for losses incurred for that location.

A software tool like PROMOD IV mimics the security-constrained unit commitment and security-constrained economic dispatch functions performed by an Independent System Operator like CAISO. As another ISO – PJM Interconnection indicates, "PROMOD IV is a production costing software application that simulates the hourly commitment and dispatch of generation to meet input load while recognizing and maintaining transmission system security limits[1]."

To provide a simple explanation, a PROMOD IV simulation is run with various inputs such as currently available generators, expected load forecasts and available transmission support for the study region like CAISO. In order to forecast energy market revenue from a large generator such as the Diablo Canyon Power Plant (DCPP), PROMOD IV

[1] https://www.pjm.com/-/media/committees-groups/committees/teac/2022/20221004/informational-only---market-efficiency-analysis-assumptions.ashx

simulations are run with and without DCPP extended operations. In each of the simulations, a metric called "adjusted production cost" is calculated for each hour in a year for each utility, e.g., PG&E in the CAISO study region.

An "Hourly PG&E Adjusted Production Cost" = PG&E Production Cost + PG&E Fixed Transaction Cost + PG&E Emergency Energy Cost + PG&E Interpool Transaction Cost + PG&E Withinpool Transaction Cost[2].

Q. Please explain how the hourly PG&E adjusted production cost is calculated in the PROMOD IV software.

A. As mentioned above, there are 5 components. I will explain each below:

- Production Cost – This cost represents the cost of operating PG&E's thermal fleet, including fuel costs, start-up costs, emission costs and variable operations and maintenance costs.
- Fixed Transaction Cost – This cost represents the cost of operating PG&E's non-thermal fleet such as wind and solar, which do not have fuel costs.
- Emergency Energy Cost – This cost represents the cost of providing energy during CAISO-declared emergency events. Typically, the emergency energy cost is $1000 per MWh.
- Interpool Transaction Cost – Recognizing that PG&E is not the sole transmission utility in the CAISO region, this interpool transaction cost provides the total cost of purchases and sales of energy that PG&E engaged with other utilities in CAISO located outside the CAISO balancing authority.
- Withinpool Transaction Cost – Any energy transactions PG&E has within its "pool," which could be defined as all transmission utilities within a single balancing authority, are captured in this withinpool transaction cost.

Q. What methodology do you utilize to forecast CAISO energy market revenues relating to extended operations of DCPP?

[2] https://cdn.misoenergy.org/20210427%20PSC%20Item%2007%20MISO%20APC%20Calculation%20Methodology%20Whitepaper544059.pdf

A. To forecast CAISO energy market revenues relating to the extended operations of DCPP, I need access to PROMOD IV simulation data results that show the hourly adjusted production cost value for PG&E with and without extended operations of DCPP. This information was not provided in the responses to the data requests SLOMFP issued.

Q. What is a market reference price in terms of CAISO market revenue forecasts?

A. Typically, the market reference price is calculated at a "trading hub." CAISO has 3 trading hubs – NP15, SP15 and ZP26[3]. Since DCPP is located close to North Path 15 (NP15), the market reference price would be the NP15 trading hub price.

Q. Is it true that the Public Utilities Commission does not identify a specific market reference price to be used in this context?

A. Yes. PG&E states, "Since the California Public Utilities Commission (Commission) does not identify a specific market reference price to be used in this context[4]."

Q. Is PG&E's use of the Power Charge Indifference Adjustment Energy Index Benchmark used in the ERRA proceeding ("PCIA Benchmark") an appropriate methodology for calculating CAISO market revenue forecasts for DCPP?

A. According to PG&E, the Power Charge Indifference Adjustment (PCIA) is "intended to ensure that any above-market costs of electric resources PG&E procured on behalf of customers who switch to another electric generation provider are not transferred to remaining PG&E electric supply customers. PG&E collects above-market costs from customers who receive their electric supply from PG&E in their bundled generation rate[5]."

Whether PG&E customers switch to another electric generation provider or not, the CAISO continues to be the market operator for PG&E. In that sense, it is a zero-sum game whether customers switch from PG&E and enter into a contract with another electric generation provider because CAISO is still the responsible Transmission Provider to provide transmission for those customers who have switched from PG&E.

[3] http://oasis.caiso.com/oasisapi/prc_hub_lmp/PRC_HUB_LMP.html
[4] PG&E Prepared Testimony, 8-2, Lines 5-6.
[5] https://pgesupport.zendesk.com/hc/en-us/articles/360057073531-What-is-the-Power-Charge-Indifference-Adjustment-PCIA-on-my-bill

Finally, PG&E states that it has chosen to use PCIA for calculating the Resource Adequacy (RA) system benchmark price because the Commission does not identify a specific market reference price[6].

Q. Is there a methodology that is better suited for calculating CAISO market revenue forecasts for DCPP besides the PCIA Benchmark?

A. Yes, PG&E should run a PROMOD IV simulation study to calculate CAISO market revenue forecasts for DCPP besides the PCIA Benchmark.

Q. Is PG&E's description of the various components required to calculate market revenue forecasts (i.e. generation volume, NP15, single annual price and portfolio weighting factor) accurate or is the formula missing a component or has the formula included a component which should be removed?

A. PG&E's description of the various components required to calculate market revenue forecasts appears to be accurate. However, I am unable to replicate the generation volumes forecasted because PG&E is using CAISO forecasted values instead of using CAISO actual generation values before the extended period of operations.

For example, "PG&E forecasts that DCPP's Unit 1 extended operations period of November 3, 2024, to December 31, 2024, is [redacted] megawatt-hours (MWh)[7]." The Maximum Dependable Capacity is 1,122 MW for Unit 1[8].

I understand that the Maximum Dependable Capacity is reduced to 25 percent on 2 days during November 3 - December 31, 2024, "The annual generation forecast includes a one-day curtailment to 25 percent power in November and a 1-day curtailment in December due to severe storms.[9]"

[6] PG&E Prepared Testimony, p. 4-4, Line 13.
[7] PG&E Prepared Testimony, p. 4-1, Line 27, but marked as confidential in Workpaper 10_DCPP-ExtendedOperations2025-Forecast_WP_PGE_20240329-Ch04_Generation Forecast-CONF_X.
[8] PG&E Prepared Testimony, p. 4-2, Line 5.
[9] PG&E Prepared Testimony, p. 4-2, Line 8.

Based on these assumptions, I calculate [redacted] megawatt-hours for Unit 1 generation forecast in 2024, lower than the PG&E [redacted] megawatt-hours value for the period of extended operations[10]. Similarly, I calculate [redacted] megawatt-hours for Unit 1 and Unit 2 generation forecast in 2025 for the period of extended operations, lower than the PG&E [redacted] megawatt-hours value.[11]

Q. Do you take any issue with the generation forecasts made by PG&E in Chapter 4, i.e. are those figures inflated?

A. Yes, I have the following concerns with the generation forecasts made by PG&E in Chapter 4 of its Prepared Testimony.

First, PG&E does not provide an explanation as to why the Actual CAISO Generation is lower than the CAISO – Actuals/Forecast values for both Units 1 and 2 in 2022 before period extended of operations. Without a reasonable explanation, I observe that Unit 1 ran [redacted] less than forecasted and Unit 2 ran [redacted] less than 2022 forecasted values.[12] The lower Actual CAISO Generation in 2022 before period extended of operations could occur again during the period of extended operations. Hence, there is a concern that the generation forecasts for Unit 1 and Unit 2 could be inflated by [redacted] and [redacted] respectively.

Second, due to refueling outage and tunnel cleaning, PG&E is forecasting reduction in DCPP production of 100% and 50%, respectively. It is unclear how PG&E is calculating the replacement costs – the cost of power to replace the DCPP power production reductions due to refueling outage and tunnel cleaning. Without a reasonable explanation for the calculation of replacement capacity costs, there is a concern that the cost of replacement power could be higher depending upon the time of the day and the season in the CAISO market. For example, during October and November 2023 – months in which refueling and tunnel cleaning is most likely to occur, the average energy price at NP15

[10] E.g. PG&E Prepared Testimony, Chapter 4; see also DCPP-ExtendedOperations2025-Forecast_Test_PGE_20240329_788417 [Workpapers for Chpt 3-4 and 6-8, p. 4-1]; Workpaper 10_DCPP-ExtendedOperations2025-Forecast_WP_PGE_20240329-Ch04_Generation Forecast-CONF_X.
[11] *Ibid*.
[12] *Ibid*.

was [redacted] per MWh[13]. This [redacted] price is 4 times the PG&E assumed replacement power price of [redacted] per MWh.

Additionally, it is not clear whether tunnel cleaning is part of either refueling (planned) outages or maintenance outages[14].

Third, PG&E shows replacement capacity only for the refueling outages and tunnel cleaning in the workpapers supporting Chapter 4 but does not include replacement capacity needed for maintenance outages, forced outages and curtailments. As PG&E mentions, during "a maintenance outage, a unit's energy production is also reduced to zero and the unit is taken offline."[15] Similarly, during forced outages and curtailments, DCPP's energy production will be "reduced to zero" and the DCPP unit is taken offline.[16] Hence, there is a concern that replacement capacity costs could be higher when compared to PG&E's estimates.

Q. Have you reviewed Appendix B to D.23-06-006 referenced by PG&E's testimony?

A. Yes.

Q. Have you reviewed the work papers supporting Chapter 8 of PG&E's testimony?

A. Yes.

Q. Has PG&E provided the data necessary to independently calculate the CAISO market revenue forecast using PG&E's PCIA Benchmark methodology? If not, what data is missing?

A. No, PG&E did not provide all the data necessary to calculate the CAISO market revenue forecast using the PCIA Benchmark methodology. The following data is missing:

- The Assumptions behind the Platts on- and off-peak NP15 monthly forward prices.
- Actual CAISO Generation values for Unit 1 and Unit 2 in 2021.
- Explanation of values in the numerator of the 3-year DCPP Ratio

[13] Historic NP-15 Tab in the 15_DCPP-ExtendedOperations2025-Forecast_WP_PGE_20240329-Ch08_Forward Power Price Derivation-CONF.
[14] PG&E Prepared Testimony, p. 4-2, Line 23.
[15] PG&E Prepared Testimony, p. 4-3, Lines 7-8.
[16] PG&E Prepared Testimony, p. 4-3, Lines 14-15 and 22-30.

- SLOMFP submitted data requests to clarify this information and PG&E merely pointed back to the data already contained in its workpapers.

Q. Please explain.

A. The CAISO energy market revenue forecast for any given year (2024/2025) is the product of the total generation forecast and the CAISO market reference price. Since I have already discussed my concerns with the total generation forecast, I focus here on how PG&E arrived at the CAISO market reference price.

As mentioned above, since the Commission did not identify a specific market reference price to be used in this proceeding, PG&E constructed a standard Power Charge Indifference Adjustment (PCIA) Energy Index Benchmark for the time period starting from November 2024 and ending in October 2030 using the "time-weighted Platts on- and off-peak North of Path 15 (NP15) monthly forward prices."[17] I was unable to replicate this Platts on- and off-peak NP15 monthly forward prices.

The off-peak prices and on-peak Platts prices were time-weighted to account for the major holidays.

Next, to arrive at the average monthly price curve during November 2024 - October 2030, the on-peak price was multiplied by the time-weight for on-peak and the off-peak price was multiplied by the time-weight for off-peak and added together.[18] I was able to replicate this calculation.

Next, for each year in the 2024-2030 time period, an average price was calculated by calculating a straight average of all the monthly values.[19] I was able to replicate this calculation.

[17] PG&E Prepared Testimony, p. 8-2.
[18] *Ibid.*
[19] PG&E Prepared Testimony, Chapter 8-2.

This average annual price for each year in the 2024-2030 time period was adjusted with a "DCPP Weight". The DCPP Weight is calculated by dividing the 3-Year DCPP Ratio by the 3-Year Average NP15 Price.[20]

I was unable to replicate the 3-Year DCPP Ratio because I was unable to reconcile the Actual CAISO Generation values for 2022 for Units 1 and 2. I was only able to reconcile 2023 values. Additionally, PG&E did not provide the 2021 Actual CAISO Generation in the workpapers supporting Chapter 4.

The DCPP Weight is critical because PG&E states, "The single annual price is then further adjusted by a portfolio weighting factor that reflects the average historical variance between generation revenues received by PCIA-eligible resources and actual average NP15 prices calculated over the prior 3-year period[21]." If the portfolio weighting factor reflects the average historical variance between the generation revenues received by PCIA-eligible resources and actual average NP15 prices, then, according to my calculations, with the limited data available (2022 and 2023 Actual CAISO Generation, not 2021), I observe a lower variance because I calculate 0.78[22] for DCPP Weight lower than the 0.93 that PG&E calculated[23].

With an updated DCPP Weight, the 2024 and 2025 CAISO Market Reference Prices are $65.54 and $57.29 respectively.[24] Hence, the forecasted Generation Revenues are $94,508,680 and $584,759,030 respectively. These values are lower - $18,601,800 (in 2024) and $115,134,960 (in 2025) - than the PG&E forecasted generation revenues.[25]

Q. Why is it critical for this information to be provided?

A. The DCPP Weight is a key piece of information in the PG&E forecast of CAISO market revenue. This DCPP Weight is critical because it signifies the average historical variance

[20] *Ibid*.
[21] *Id*. at line 13.
[22] Attachment A [SLOMFP Forward Power Price Derivation].
[23] DCPP-ExtendedOperations2025-Forecast_Test_PGE_20240329_788417[Workpapers for Chpt 3-4 and 6-8, p. 8-3].
[24] Attachment B [SLMOFP Market Revenue Calculations].
[25] See Attachment B [SLMOFP Market Revenue Calculations]; DCPP-ExtendedOperations2025-Forecast_Test_PGE_20240329_788417[Workpapers for Chpt 3-4 and 6-8, p. 8-2].

between the generation revenues received by Power Charge Indifference Adjustment (PCIA) eligible resources and actual average NP15 prices. Hence it is critical to understand the drivers behind the historical variance to understand the DCPP Weight.

Q. Can you replicate PG&E's forecasts of CAISO market revenue without this information?

A. Yes, I was able to replicate PG&E's forecasts of CAISO market revenue without this information.

Q. Does PG&E's show how it reached the single annual price for its PCIA Benchmark calculation methodology?

A. Yes.

Q. Does PG&E's show how it calculated the portfolio weighting factor for its PCIA Benchmark calculation methodology?

A. Yes.

Q. Do the workpapers for Chapter 8 of PG&E's testimony provide the required information to allow independent vetting of the accuracy of the CAISO market revenue forecasts?

A. No. As mentioned above, the workpapers for Chapter 8 of PG&E's testimony do not provide the required information for DCPP Weight and underlying assumptions behind the Platts forecast. Additionally, the 2021 Actual CAISO Generation for Units 1 and 2 were not provided by PG&E.

Q. What is your opinion, based on the information made available, as to the accuracy of PG&E's forecast of CAISO market revenues?

A. At this time, it appears that PG&E's forecast of CAISO market revenues are higher based on unexplained generation revenues received by Power Charge Indifference Adjustment (PCIA) eligible resources, which are a key input for the DCPP Weight.

Q. Are PG&E's CAISO market revenue forecasts inflated?

A. Yes, it appears so.

Q. What are the impacts of an inflated forecast of CAISO market revenues on the revenue requirement that will be recovered from statewide customers?

A. A lower revenue may mean less of an offset against the cost of extended operations at DCPP. Therefore, higher costs will be recovered from and paid by ratepayers in California.

III. ANALYSIS OF NEW RELIABILITY INFORMATION

Q: Can California maintain power reliability without the 2,240 MW from DCPP, even during extreme heat events?

A. Yes. California can maintain power reliability without the 2,240 MW from DCPP even during extreme heat events. This conclusion is based on three data points.

First, CAISO currently has more than 8,500 MW of energy storage capacity, with additional storage being added annually. Additionally, there is up to 5,000 MW of demand response available. This combined capacity is more than sufficient to ensure grid reliability even during extreme heat events.

Second, by the end of 2023, California had at least 5,424 MW of excess capacity.[26] This excess capacity takes into account only the projects that have already been constructed and interconnected.

Finally, California's battery storage capacity has been increasing each year, from 500 MW in 2018 to over 10,300 MW in 2023. By the end of 2024, an additional 3,800 MW is planned to come online. California projects a need for 52,000 MW of battery storage by 2045[27]. Given the historical growth rate (10,000 MW in 5 years), California is likely to meet this projection well before 2045.[28]

V. SUMMARY AND CONCLUSION

Q. Please summarize your conclusions?

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[26] Attachment C [Konidena, R., *California has enough power to keep the lights on without DCPP* (July 17, 2024)].

[27] See California Energy Storage Survey here on the California Energy Commission website updated as of April 15, 2024 - https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/california-energy-storage-system-survey.

[28] Attachment C [Konidena, R., *California has enough power to keep the lights on without DCPP* (July 17, 2024)].

A. Yes, my conclusions are as follows:

- The PROMOD IV simulation study is a better methodology than the ERRA Benchmark for calculating CAISO market revenue forecasts for DCPP.
- PG&E's description of the various components required to calculate market revenue forecasts appears to be accurate but I was unable to replicate the generation volumes forecasted because PG&E is using CAISO forecasted values instead of using CAISO actual generation values before the extended period of operations.
- There are concerns with PG&E's generation forecasts in Chapter 4, which lead me to conclude that replacement capacity costs could be higher than PG&E's estimates.
- PG&E did not provide all the data necessary to calculate the CAISO market revenue forecast using the ERRA Benchmark methodology. For instance, the workpapers for Chapter 8 of PG&E's testimony do not provide the required information for DCPP Weight and underlying assumptions behind the Platts forecast. Additionally, the 2021 Actual CAISO Generation for Units 1 and 2 was not provided and therefore PG&E's CAISO market revenue forecasts are questionable.
- As a result, PG&E's forecast of CAISO market revenues appears to be higher based on unexplained generation revenues received by Power Charge Indifference Adjustment (PCIA) eligible resources, which are a key input for the DCPP Weight.
- If DCPP's operations are not extended past 2025, California will still not experience an energy reliability problem even in times of excessive heatwaves.

Q. Does this conclude your testimony?

A. Yes, it does.

ATTACHMENT A

PACIFIC GAS AND ELECTRIC COMPANY

DIABLO CANYON POWER PLANT 2025 COST RECOVERY FORECAST TO SUPPORT OPERATIONS AS DIRECTED BY THE STATE TO ENSURE ELECTRIC RELIABILITY AND TO REDUCE GREENHOUSE GAS EMISSIONS FOR ALL CALIFORNIANS

WORKPAPERS SUPPORTING CHAPTER 8
CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION MARKET REVENUES
FORWARD POWER PRICE DERIVATION

Year	Month	Date	Avg Price
2024	11	11/01/24	[redacted]
2024	12	12/01/24	
2025	1	01/01/25	
2025	2	02/01/25	
2025	3	03/01/25	
2025	4	04/01/25	
2025	5	05/01/25	
2025	6	06/01/25	
2025	7	07/01/25	
2025	8	08/01/25	
2025	9	09/01/25	
2025	10	10/01/25	
2025	11	11/01/25	
2025	12	12/01/25	
2026	1	01/01/26	
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2026	3	03/01/26	
2026	4	04/01/26	
2026	5	05/01/26	
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2026	7	07/01/26	
2026	8	08/01/26	
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2027	1	01/01/27	
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2027	3	03/01/27	
2027	4	04/01/27	
2027	5	05/01/27	
2027	6	06/01/27	
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2029	10	10/01/29	
2029	11	11/01/29	
2029	12	12/01/29	
2030	1	01/01/30	
2030	2	02/01/30	
2030	3	03/01/30	
2030	4	04/01/30	
2030	5	05/01/30	
2030	6	06/01/30	
2030	7	07/01/30	
2030	8	08/01/30	
2030	9	09/01/30	
2030	10	10/01/30	

Row Labels	Average of Avg Price	Adjusted Price
2024	84.02	65.54
2025	73.45	57.29
2026	73.69	57.47
2027	72.37	56.45
2028	70.51	55.00
2029	71.04	55.41
2030	67.90	52.96
Grand Total	**71.94**	

DCPP Weight

0.78

PACIFIC GAS AND ELECTRIC COMPANY
DIABLO CANYON POWER PLANT 2025 COST RECOVERY FORECAST TO SUPPORT OPERATIONS AS DIRECTED BY THE STATE TO ENSURE ELECTRIC RELIABILITY AND TO REDUCE GREENHOUSE GAS EMISSIONS FOR ALL CALIFORNIANS

WORKPAPERS SUPPORTING CHAPTER 8
CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION MARKET REVENUES
FORWARD POWER PRICE DERIVATION - PG&E CALCULATION

Row Labels	DIABLO_7_UNIT 1	DIABLO_7_UNIT 2	Grand Total
2021	$ (478,499,345.20)	$ (334,477,264.90)	$ (812,976,610.09)
2022	$ (757,381,763.70)	$ (727,791,708.73)	$ (1,485,173,472.43)
2023	$ (449,952,876.59)	$ (526,105,715.76)	$ (976,058,592.35)
Grand Total	$ (1,685,833,985.49)	$ (1,588,374,689.39)	$ (3,274,208,674.88)

MWh

Row Labels	DIABLO_7_UNIT 1	DIABLO_7_UNIT 2	Grand Total
2021	9,854,371.70	6,651,740.14	16,506,111.85
2022	8,915,481.58	8,729,836.67	17,645,318.25
2023	8,196,055.07	9,543,051.47	17,739,106.54
Grand Total	26,965,908.36	24,924,628.29	51,890,536.64

3-Year DCPP Ratio	63.10
3-year Avg NP15 Price	67.59
DCPP weight	0.93

2021 Row Label/MWh	[redacted]
2022 Row Label/MWh	
2023 Row Label/MWh	

PACIFIC GAS AND ELECTRIC COMPANY
DIABLO CANYON POWER PLANT 2025 COST RECOVERY FORECAST TO SUPPORT OPERATIONS AS DIRECTED BY THE STATE TO ENSURE ELECTRIC RELIABILITY AND TO REDUCE GREENHOUSE GAS EMISSIONS FOR ALL CALIFORNIANS

WORKPAPERS SUPPORTING CHAPTER 8
CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION MARKET REVENUES
FORWARD POWER PRICE DERIVATION - SLOMFP CALCULATION

Row Labels	DIABLO_7_UNIT 1	DIABLO_7_UNIT 2	Grand Total
2021	$ (478,499,345.20)	$ (334,477,264.90)	$ (812,976,610.09)
2022	$ (179,569,898.55)	$ (117,235,706.68)	$ (296,805,605.23)
2023	$ (449,952,876.59)	$ (526,105,715.76)	$ (976,058,592.35)
Grand Total	$ (1,685,833,985.49)	$ (1,588,374,689.39)	$ (2,085,840,807.68)

MWh

Row Labels	DIABLO_7_UNIT 1	DIABLO_7_UNIT 2	Grand Total
2021	9,854,371.70	6,651,740.14	16,506,111.85
2022	3,264,907.25	2,131,558.30	5,396,465.55
2023	8,196,055.07	9,543,051.47	17,739,106.54
Grand Total	26,965,908.36	24,924,628.29	39,641,683.94

3-Year DCPP Ratio	52.62
3-year Avg NP15 Price	67.59
DCPP weight	0.78

ATTACHMENT B

PG&E Calculation				
		Total	CAISO Market	Generation
		Generation	Reference Price	Revenues
Line No	Year	GWh	$/Megawatt-hour	
1	2024	[redacted]	78.44	$ 113,110,480
2	2025	[redacted]	68.57	$ 699,893,990
SLOMFP Calculation				
		Total	CAISO Market	Generation
		Generation	Reference Price	Revenues
Line No	Year	GWh	$/Megawatt-hour	
1	2024	[redacted]	65.54	$ 94,508,680
2	2025	[redacted]	57.29	$ 584,759,030
			Difference - 2024	$ 18,601,800
			Difference - 2025	$ 115,134,960

ATTACHMENT C

California has enough power to keep the lights on without DCPP.

Prepared by Rao Konidena, Rakon Energy LLC[1]
On Behalf of San Luis Obispo Mothers for Peace
July 17, 2024

Summary of Key Points

- **California has enough power (including storage) to keep the lights on** – without the 2,200 MW of Diablo Canyon Power Plant (DCPP) – **even during extreme heat events.**
    - **The California Independent System Operator (CAISO) now has more than 8,500 MW of energy storage capacity** (with more being added each year), **plus up to 5,000 MW of demand response, which is more than sufficient to ensure grid reliability.**
    - Even if we focus only on "have already been constructed and interconnected" by the end of 2023, as does the Proposed Decision in the California Public Utilities Commission Rulemaking (October 26, 2023), **California will have at least 5,424 MW of excess capacity by the end of 2024.**
    - **California** battery capacity increases every year: **from 500 megawatts (MW) in 2018 to more than 10,300 MW in 2023, with an additional 3,800 MW planned to come online by the end of 2024. The state projects 52,000 MW of battery storage will be needed by 2045 (*i.e.,* an additional 40,000 MW in 20 years). Given the historical growth of battery storage (10,000 MW in 5 years), California is likely to meet the projection well before 2045.**
- This data comes from the CPUC and the California Energy Commission (CEC), reliable sources. Inexplicably, however, the CEC staff's draft September 2023 report omitted over 10,000 MW of renewables from its analysis of whether continued operation of the DCPP is needed to ensure grid reliability. (This is the last available report from the CEC, and only a draft.[2]

- The CEC staff's erroneous analysis is bad for California's clean energy future because:
    - DCPP's high cost and inflexibility hinders deployment of more renewables and storage.
    - Favoring DCPP as an inflexible electricity supplier will drive out flexible renewables ***and thereby increase the danger of blackouts.***

[1] Mr. Konidena is an independent energy consultant, focusing on wholesale market practices and policy. From 2003 to 2018, he was employed by the Midcontinent Independent System Operator (MISO), where he used a range of software tools for resource forecasting and planning, including MISO's Planning Resource Auction and Module E Capacity Tracking (MECT) tool and the Electric Generation Expansion Analysis System (EGEAS). Before leaving MISO in 2018, his title was Principal Advisor in Transmission Asset Management.

[2] Other than CEC updates to the energy storage installation numbers from the California Energy Storage System Survey (https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/california-energy-storage-system-survey), I have not seen any CEC report that includes the latest energy storage capacity.

Technical Analysis

In June 2023, I testified in a CPUC proceeding that the retirement of DCPP in 2024 and 2025, as previously planned, will not have an adverse impact on local reliability of San Luis Obispo and that it would impede the development of other low or zero-carbon alternatives. Since then, two reports from the CPUC and the CEC show that California's renewable electricity capacity has continued to grow at an unprecedented and unexpected rate, such that California has enough power to keep the lights on – without the 2,200 MW of DCPP – even during extreme heat events. These two reports are the following:

First, from the Joint Agency (CPUC + CEC) report "Joint Reliability Planning Assessment - Fourth Quarterly Report" issued in December 20233, it is clear that the need for contingency resources did not worsen since March 2023:

> "Through summer 2023, analysis indicates that the state maintained surplus capacity under average weather conditions. Under extreme weather conditions, such as those witnessed in the August 2020 heat wave (2020 equivalent event) and the September 2022 heat wave (2022 equivalent event), projected need for contingency resources did not worsen compared to the February 2023 first quarterly report."[4]

Even though the report projects a shortfall of 2,606 MW for a 2022 equivalent extreme event[5], that can be easily handled by the 2,444 MW of available contingency reserves[6], plus 4,800 MW of demand response[7].

Additionally, Table 1, which is copied from the Joint Agency report, estimates the addition of 5,499 MW as a "net qualifying capacity" in September 2023.

[3] Yee Yang, Chie Hong (CEC) and Sarah Goldmuntz (CPUC). December 2023. Joint Agency Reliability Planning Assessment. California Energy Commission. Publication Number: CEC-200-2023-015.

[4] Executive Summary, Ibid.

[5] Table 5, Ibid.

[6] Table 6, Ibid.

[7] https://www.canarymedia.com/articles/nuclear/california-faces-big-power-challenges-even-if-diablo-canyon-stays-open

Table 1: Cumulative Resource Additions, January 2020 Through August 30, 2023

Technology Type	Nameplate Capacity (MW)	Estimated Sept. Net Qualifying Capacity (NQC) MW	Number of Projects*
Storage	4,919	4,556	69
Solar	3,993	345	64
Hybrid (Storage/Solar)	1,034	464	17
Wind	783	103	20
Geothermal	41	31	1
Biogas, Biomass, Hydro	36	1	9 (2,3,4)
Subtotal SB 100 Resources, In-California Independent System Operator	10,806	5,499	180
Natural Gas, incl. Alamitos & Huntington Beach	1,477	1,474	12
Total Resources, In-California Independent System Operator	12,282	6,973	192
New Imports, Pseudo-Tie[2] or Dynamically Scheduled	1,689	727	13
Total Resources, Including Imports	13,971	7,701	205

Source: CPUC staff[3]

This 5,499 MW additional capacity includes 4,556 MW of energy storage available during the top summer demand hours, reducing the risk of blackouts in California. But this number is too low. In fact, CAISO has released a statement[8] that CAISO has more than 5,000 MW of energy storage capacity as of July 2023. This 5,000 MW of energy storage will be available to reduce the blackout risk in California due to wildfires or other issues.

I also note that, according to the "California Energy Storage System Survey" results posted on the CEC website[9], CA now has 10,383 MW of battery storage capacity, of which 1,076 MW is from the residential customer, 571 MW from the commercial customer and 8,736 MW from the utility customer sector. The Survey notes an additional 3,800 MW is still planned to come online by the end of 2024. Hence, as of December 31, 2024, the CEC projects that California will have 14,100 MW total of energy storage capacity available to reduce the blackout risk, with more coming online every year.

Additional tables in the Joint Agency report show the quarter-by-quarter estimate of new resources coming online in California based on the CPUC data. I have compiled the data from these tables into Table A below, which shows that California added 2,076 MW by August 1, 2023, and will add nearly 5,000 MW more before June 1 every year during 2024-2026 for a total of 18,500 MW by June 2026. This is greatly in excess of the 11,500 MW required by the CPUC in Decision D.21-06-035 (2021). Thus, California is overbuilding renewable capacity by at least 7,000 MW, three times the capacity of DCPP.

[8] "Storage surpasses 5,000 MW on the CAISO grid." http://www.caiso.com/about/Pages/Blog/Posts/Storage-surpasses-5000-MW-on-the-CAISO-grid.aspx

[9] https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/california-energy-storage-system-survey

Table A- California is overbuilding capacity by at least 7,000 MW.

Required Date	**D.21-06-035 Requirements (PG&E recommended baseline)**	**SB 846 Fourth Quarterly Report**	**Extra Capacity Built**
August 1, 2023	2,000 MW	2,076 MW (Source – Table 3, 2023 Q3 value)	76 MW
June 1, 2024	6,000 MW	5,398 MW (Source – Table 3, 2024 Q2 value of 7,474 MW minus 2,076 MW)	-602 MW (deficit)
June 1, 2025	1,500 MW	4,800 MW (Source – Table 4, 2025 Q2 value of 10,198 MW minus 5,398 MW)	3,300 MW
June 1, 2026	2,000 MW	6,226 MW(Source – Table 4, 2026 Q2 value of 11,026 MW minus 6,226 MW)	4,226 MW
Total	**11,500 MW**	**18,500 MW** (Sum of 2076, 5398, 4800, and 6226)	**7,000 MW**

Second, after the Joint Agency third quarterly report was issued in August[10], the CEC staff issued a draft report[11] in September. In addition to the Joint Agency report that documented an expectation of 10,230 MW of renewable capacity to be online by 2026, the draft CEC report shows an improved resource picture due to acknowledgment of the role of demand response in keeping the lights on. The CEC staff estimated additional potential for 3,600 MW of demand response by 2025. While I believe this figure is too low by 1,200 MW (see below), the combined significant volume of new renewable capacity predicted by the Joint Agency and the significant demand response predicted by the CEC staff greatly increase California's likelihood of staying reliable during peak summer conditions. See Table B below.

[10] Kootstra, Mark (CEC) and Nathan Barcic (CPUC). 2023. Joint Agency Reliability Planning Assessment. California Energy Commission. Publication Number: CEC-200-2023-011.

[11] Erne, David and Chie Hong Yee Yang. September 2023. Draft SB 846 Diablo Canyon Power Plant Extension Cost Comparison. California Energy Commission. Publication Number: CEC-200-2023-013-SD.

Table B - Expected Cumulative New September Net Qualifying Capacity (MW) from Joint Agency Fourth Quarterly report.

Resource Type	2023 Q1	2023 Q2	2023 Q3	2023 Q4	2024 Q1	2024 Q2	2024 Q3	2024 Q4
Solar	7	26	101	150	182	318	321	331
Battery	654	810	1,302	1,825	2,504	5,199	5,528	5,538
Paired /Hybrid	395	473	638	1,280	1,446	1,847	1,856	2,324
Wind	-	14	14	14	14	14	14	14
Geothermal	21	21	21	21	21	74	74	92
Biomass /Biogas	-	-	-	3	22	22	22	25
Total	1,076	1,344	2,076	3,293	4,188	7,474	7,814	8,324

Source: CPUC staff, data as of August 2023

Resource Type	2025 Q1	2025 Q2	2025 Q3	2025 Q4	2026 Q1	2026 Q2	2026 Q3	2026 Q4
Solar	441	459	459	459	462	462	462	462
Battery	5,972	6,743	6,743	6,743	6,865	7,221	7,221	7,221
Paired /Hybrid	2,498	2,815	2,929	2,993	3,001	3,061	3,061	3,061
Wind	14	31	31	31	31	60	60	60
Geothermal	93	122	143	144	160	195	195	200
Biomass /Biogas	25	28	28	28	28	28	28	28
Total	9,043	10,198	10,333	10,398	10,546	11,026	11,026	11,030

Even limiting the analysis to resources that "have already been constructed and interconnected" by the end of 2023, as does the Proposed Decision adopted by the CPUC today[12], California still has at least 1,075 MW surplus capacity by the end of 2023. (As shown below in Table C, the "Net Gain" exceeds the "Net Shortfall" by 1,075 MW).

[12] PROPOSED DECISION OF ALJ SEYBERT (Mailed 10/26/2023).

Table C - California has at least 5,424 MW of excess capacity by the end of 2024, based on Joint Agency Fourth Quarterly report and California Energy Storage System Survey.

Category	Capacity (MW)
DCPP	2,200
3,293 constructed & Interconnected by 2023 + 549 MW installed Battery Energy Storage System (BESS) as of 04/15/24 + 3,800 MW planned BESS online by 12/31/24	7,642
Net Gain if DCPP were retired	5,442
Contingency Reserves	2,588
2022 Equivalent Event shortfall	-2,606
Net Shortfall	18
Bottomline by the end of 2023	5,424

However, it is important to note that a number of significant improvements shown above are not credited in the CEC staff's analysis. Most significantly, the CEC staff report excludes almost all of the 10,230 MW of renewables because they supposedly "compete with the Integrated Resource Planning procurement orders." The 10,230 MW of excluded resources has increased to 11,030 MW in the Joint Agency fourth quarterly report, which are listed in Table B. The CEC staff's failure to credit these renewable resources does not make sense because they are being built in California for the purpose of building capacity and because they can substantially reduce the likelihood of blackouts in California. This substantial volume of renewable capacity should be counted in agency forecasts, not ignored.
In addition to excluding 10,230 MW of renewables (which has increased to 11,030 MW in the Joint Agency fourth quarterly report), the draft September CEC staff's analysis only recognizes 3,600 MW potential for Demand Response in CA by 2025. But when the California Governor initiated Emergency Alerts13 on September 6, 2022, 4,800 MW of demand was reduced.14 Therefore, potential demand response should be increased by at least 1,200 MW.

The draft September CEC staff report also assumes it takes 6 years for new resources to interconnect when new and improved interconnection reforms at other grid operators estimate 1-2 years. Based on new requirements from the Federal Energy Regulatory Commission (FERC) and recent experience, new renewable resources should be expected to be online much sooner.

[13] https://www.gov.ca.gov/2022/09/06/as-record-heat-wave-intensifies-governor-newsom-extends-emergency-response-to-increase-energy-supplies-and-reduce-demand/

[14] https://www.canarymedia.com/articles/nuclear/california-faces-big-power-challenges-even-if-diablo-canyon-stays-open

Finally, the draft CEC staff report is hampered by including the inflexible and expensive 24/7 DCPP operation, when California needs flexible resources to provide reliable, low cost electricity sources. The 2022 rolling blackouts provide an illustration of this phenomenon. CAISO has to maintain 26% planning reserve margin at all times, including covering the threat of loss of the largest power generator on the grid. Thus, one of the contributing factors to the 2020 rolling blackouts was the fact that CAISO needed an additional reserve margin of 2200 MW, just in case DCPP unexpectedly went off-line during the two-hour demand peak.[15] In short, the operation of DCPP increased the blackout risk rather than reducing it.

Therefore, it is important to evaluate the data presented by the CEC and the Joint Agency, rather than relying on the CEC's distorted analysis. The data strongly show that CA has enough energy to keep the lights on without extended operation of DCPP.

[15] https://calmatters.org/commentary/2022/07/the-diablo-canyon-power-plant-wont-stop-power-outages/

RAO KONIDENA

ENERGY MARKET EXPERTISE IN DISTRIBUTED ENERGY RESOURCES

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Rao Konidena is an independent energy consultant. He worked at the Midcontinent Independent System Operator (MISO) for 15 years. Before he left MISO, he was the Principal Advisor for Policy Studies, working on energy storage and distributed energy resources. At MISO, Rao worked in management and non-management roles around resource adequacy, economic planning, business management, and policy functions.

Rao is the President of the Finnish American Chamber of Commerce – Minnesota (FACC-MN) and sits on the Board of Ever Green Energy and Minnesota Solar Energy Industries Association (MnSEIA).

EXPERIENCE

RAKON ENERGY LLC, Roseville, MN
President & Chief Executive Officer (CEO) May 2018 – Present

Providing consulting services related to Federal and state energy policies focusing on energy storage and distributed energy resources

- A renewable energy developer engaged Rakon Energy to provide MISO expertise for their renewable energy project portfolio in various stages and study cycles of the Generator Interconnection Queue and the capacity credit impact from MISO's seasonal capacity construct.
- An Independent Power Producer engaged Rakon's services to understand MISO's seasonal resource adequacy construct and its impact on Power Purchase Agreement negotiations with a MISO utility.
- An aggregator engaged Rakon Energy as part of the team to represent their interests at RTO stakeholder committees on FERC Order 2222.
- Rakon Energy was part of the team engaged by a technology company to represent their interests at the PJM RTO. Another similar company hired Rao to navigate MISO's market rules for data center interconnection.
- Advanced Energy Economy and the Natural Resources Defense Council's Sustainable FERC Project engaged Rakon to monitor MISO's FERC Order 2222 implementation process.
- The Commonwealth of Pennsylvania's Office of Consumer Advocate engaged Rakon Energy LLC to support OCA's response to the questions posed by the Pennsylvania Public Utility Commission's Secretary in the policy proceeding - Utilization of Storage Resources as Electric Distribution Assets.
- A prominent solar advocacy group currently engaged Rao for expert testimony work in Nevada and Minnesota IOUs IRP filing.
- He submitted comments to Minnesota and Colorado Public Utilities Commission on Integrated Distribution Planning dockets.
- He has provided expert testimony support for Environmental Law and Policy Center (ELPC) at the Public Service Commission of Wisconsin (PSCW) on the MISO Multi-Value Project (MVP) line in Wisconsin.
- He provided affidavit support for the Office of the People's Counsel of the District of Columbia (OPC-DC) at the Federal Energy Regulatory Commission (FERC) on PJM's Reserves Pricing Proposal and municipal utilities in Wisconsin and Missouri at FERC on MISO's Resource Adequacy construct.
- He provided advocacy support for Energy Storage Association (ESA) at MISO on FERC Order 841 Compliance.
- He provided training as part of the Tuatara team on DERs to Colombia's grid operator XM and the ESTA International team on energy storage benefits to Mexican regulator CRE.

Advisor, Volunteer, Pro-Bono assignments

- Rao presented on Distributed Energy Resources (DER) and peer-reviewed Demand Side Management and DER plans for Central American regulators, as part of NARUC International Peer Review.
- Rao presented and shared best practices around the impact of provisioning ancillary services. At an Eastern Africa regional workshop organized by the United States Energy Agency (USEA), the United

States Agency for International Development (USAID) and the Power Africa initiative.

MIDCONTINENT INDEPENDENT SYSTEM OPERATOR (MISO), Eagan, MN
Principal Advisor, Policy Studies Aug 2015 – May 2018

- Recognized as an expert on all thing's energy storage and distributed energy resources from an economic transmission planning perspective
- Project manager for long term independent load forecast and demand response/energy efficiency/distributed generation potential study.
- MISO representative on Department of Energy (DOE) US DRIVE Grid Interaction Technical Team

Senior Manager, Transmission Asset Management Operations Feb 2013 – July 2015
- He engaged the division lead in the development of strategic initiatives and operating plans.
- Rao chaired the Economic Modeling Framework Working Group of international Grid operators GO-15.

Manager, Resource Forecasting (started at Engineer II) Sep 2003 – Jan 2013
- ***Main Accomplishments***
  - In this role, I directed the Demand Response & Energy Efficiency potential study for MISO, with the support of Global Energy Partners consultants.
  - Directed the MISO Energy Storage Study identifying the economic potential for grid-scale energy storage in MISO footprint, providing strategic consulting services to investor-owned utilities, public power utilities, asset owners, and investors.
- ***Regulatory Experience***
  - Responsible for analytical assessments that meet MISO's Federal Energy regulatory compliance obligations as well as our Transmission Owners (e.g., FERC Market-based rates).
  - Responsible for supporting state regulators and MISO Board of Directors with technical analysis related to policy drivers.

PWRSOLUTIONS, Inc., Dallas, TX (Consulting) May 2001 – August 2003
Student Intern and Electrical Engineer
- Rao executed generator interconnection studies for Independent Power Producers (IPPs) clients.
- Analyzed future generator and transmission needs in the Eastern Interconnection.

EDUCATION

THE UNIVERSITY OF MINNESOTA, Minneapolis, Minnesota
Carlson School of Management
Master of Business Administration, Global Executive Program May 2011
Emphases: Strategic Management, International Business

- Responsible for all financial aspects of marketing mobile charging services for Electric vehicles in the Singapore market.

UNIVERSITY OF TEXAS AT ARLINGTON, Arlington, Texas
Energy Systems Research Center (ESRC)
Master of Science in **Electrical Engineering** May 2002

- Master's Thesis in Economic Analysis of Distributed Generation (Photovoltaics (P.V.) and Fuel Cells)

BLOG POSTING, PUBLICATIONS & PRESENTATIONS

1. Co-Author for a graduate level textbook titled "Modern Electricity Systems: Engineering, Operations, and Policy to address Human and Environmental Needs". Release date - August 2022 with Wiley.
2. **He has authored multiple publications in Electricity Journal, Renewable Energy World (blog), and other peer-reviewed industry journals.**

BOARD & VOLUNTEER ACTIVITIES

- Board of Directors, Ever Green Energy. Sep 2019 – present

- Board of Directors, Minnesota Solar Energy Industries Association. Sep 2020 - present
- President, Finnish American Chamber of Commerce – Minnesota (FACC-MN). Jan 2016 - present