Docket No.: R.23-01-007

Exhibit No.: _____

Date: June 9, 2023

Witnesses: Eric Little and Andrew Mills

OPENING TESTIMONY OF ERIC LITTLE AND ANDREW MILLS
ON BEHALF OF
THE CALIFORNIA COMMUNITY CHOICE ASSOCIATION

RULEMAKING IMPLEMENTING SENATE BILL 846 CONCERNING POTENTIAL EXTENSION OF DIABLO CANYON POWER PLAN OPERATIONS

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ATTACHMENTS

I. INTRODUCTION AND SUMMARY OF TESTIMONY

The California Community Choice Association (**CalCCA**) presents this opening testimony in the *Rulemaking Implementing Senate Bill 846* (**SB 846**) *Concerning Potential Extension of Diablo Canyon Power Plant Operations* (**DCPP OIR**). This testimony has been jointly prepared on behalf of CalCCA by Eric Little, Director of Regulatory Affairs at CalCCA, and Andrew Mills, Director of Data Analytics at CalCCA. Mr. Little's and Mr. Mills' qualifications are set forth in Attachments A and B.

CalCCA's members and their customers will be directly affected by the Diablo Canyon Power Plant (**DCPP**) extended operations and this DCPP OIR. Senate Bill (**SB**) 846 directs that certain costs of extended operations will be recovered from customers of all load-serving entities (**LSEs**) subject to the Commission's jurisdiction, including customers of community choice aggregators (**CCAs**).

This testimony addresses issues falling within Phase 1: Track 2 as established in the April 6, 2023, Assigned Commissioner's Scoping Memo and Ruling.[1] CalCCA's proposals are set forth in detail in the testimony of Brian Dickman. This testimony supports Mr. Dickman's proposals on the following Phase I, Track 2 scoping issue:

5. Whether and how the benefits of extended operations, including resource adequacy and greenhouse gas-free attributes, should be allocated among the load-serving entities (LSEs) and customers paying for extended operations.

As described further in Mr. Dickman's testimony, CalCCA recommends the following, among other things, with regard to Issue 5:

[1] Rulemaking (**R.**) 23-01-007, *Assigned Commissioner's Scoping Memo and Ruling* at 5-6 (April 6, 2023).

- The Commission should adopt the same process currently used for resources subject to the Cost Allocation Mechanism to allocate DCPP's resource adequacy (**RA**) capacity to all LSEs contributing toward cost recovery. Capacity should be allocated based on each entity's proportional contribution to the group's combined 12-month coincident peak.

Mr. Dickman's testimony relies, in part, on the attached March 20, 2023, analysis entitled *California's Constrained Resource Adequacy Market: Ratepayers Left Standing In A Game Of Musical Chairs*, as updated within this testimony (Attachment C, **CalCCA Stack Analysis**).

II. CALCCA STACK ANALYSIS

We prepared the CalCCA Stack Analysis on CalCCA's behalf to examine whether RA supply is sufficient to meet the requirements the Commission imposes on LSEs. The CalCCA Stack Analysis concludes supply insufficiency will make it challenging, if not impossible, for LSEs to meet year-ahead requirements in the years 2023-2026. While it is possible that the month-ahead results could look more promising if there is a material increase in available hydro (as has happened in 2023), imports, or sales of excess by the IOUs following the year-ahead showing, the insufficiency likely will carry into month-ahead compliance showings in future years. The only durable solution is to bring new resources online, yet new resources continue to face supply chain, interconnection, and permitting challenges. Until those challenges are met holistically, RA supply will remain tight, and prices paid by consumers will remain high.

While the methodologies and conclusions in the attached CalCCA Stack Analysis remain the same as those from March of this year, below we have updated the information used to calculate "Figure 2" in that analysis. The "Updated Figure 2" below

reflects the most recently available information on the capacity available to meet September RA requirements and compares it to the demands for RA capacity based upon regulation and actions expected by market participants.

Updated Figure 2. CalCCA RA Stack Analysis for September

	September NQC	2023	2024	2025	2026
1	CAISO 1-in-2 Load	46,829	47,475	47,987	48,487
2	Reserve Margin (16% in '23, 17% after)	7,493	8,071	8,158	8,243
3	**Total RA Demand**	**54,322**	**55,546**	**56,145**	**56,730**
4	2023 NQC List	47,618	47,618	47,618	47,618
5	Event-Based Demand Response	1,090	1,105	1,111	1,111
6	Imports	6,000	6,000	6,000	6,000
7	Estimate of Contracted Resources	1,849	7,297	9,168	9,409
8	Thermal Derates from 2023 NQC List	(719)	(719)	(719)	(719)
9	Remove Diablo from Planning	-	-	(2,280)	(2,280)
10	OTC, Retired or Contracted by DWR	-	(3,692)	(3,692)	(3,692)
11	Excess IOU Procurement for Higher Effective PRM	(206)	(1,700)	(1,700)	-
12	Supply-Side Emergency Reliability Procure. (D.21-12-015)	(1,125)	-	-	-
13	Retention for Substitution	(619)	(619)	(619)	(619)
14	**Total RA Supply**	**53,888**	**55,290**	**54,886**	**56,827**
15	Surplus Supply (Deficit) [Assuming Loss of Diablo]	(433)	(256)	(1,258)	98

Lines 1 and 2 represent the total amount of capacity needed to satisfy the RA requirements. This is composed of the expected peak load for the California Independent System Operator (**CAISO**) balancing authority area[2] and a Planning Reserve Margin.[3] Line 3 depicts the total RA requirement found by summing lines 1 and 2.

Lines 4 through 6 represent the amount of CAISO-connected capacity that can be expected from a variety of resources forecast to be available to meet the RA needs. Line 4 represents the maximum RA value claimable for generating resources connected to the

[2] The expected peak load is the monthly maximum of the CAISO Managed Net Load from the California Energy Demand 2022 Hourly Forecast for CAISO using the Planning Scenario (https://efiling.energy.ca.gov/GetDocument.aspx?tn=248359&DocumentContentId=82768).

[3] The planning reserve margin for 2023 is 16% of the peak demand. This increases to 17% in 2024 and is assumed to continue at that level for 2025 and 2026 based on California Public Utility Commission (**CPUC**) Decision (**D.**) 22-06-050.

CAISO.[4] Line 5 represents event-based demand response which can reduce consumption to meet RA needs.[5]

Line 6 represents an estimate of imported resources that can be used to meet RA needs from neighboring balancing authorities.[6] The amount of capacity from import resources can vary dramatically from the year-ahead RA supply to the monthly RA supply. This stack analysis shows the likely import capacity in the month-ahead RA market, which is significantly higher than the amount of import capacity that has historically been shown by Load Serving Entities in the year-ahead process. The CAISO published information showing that in 2022 RA from import resources was as low as 3,577.87[7] MW in the 2022 year ahead showing which is significantly lower than the assumed Stack Analysis of 6,000 MW.

Line 7 represents new contracted capacity that is estimated to come online to meet CPUC authorized procurement to address reliability needs in California.[8]

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[4] CAISO 2023 NQC list as of June 1, 2023 (https://www.caiso.com/Documents/Final-Net-Qualifying-Capacity-Report-For-Compliance-Year-2023.xls). In order to align capacity estimates in the NQC list with the CPUC's expectations for new resources, we removed any resources with commercial online dates after January 1, 2023, from this list. All resources with later commercial online dates are included in line 7.

[5] Event-based demand response estimates for each of the IOUs in 2023, 2024, and 2025 are provided in the CPUC RA compliance materials (https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/resource-adequacy-homepage/resource-adequacy-compliance-materials). We assume demand response in 2026 is equivalent to 2025.

[6] We use the same import assumption as used in the Joint Reliability Planning Assessment - SB 846 Second Quarterly Report, Table 4 (https://efiling.energy.ca.gov/GetDocument.aspx?tn=250176&DocumentContentId=84899). The assumed imports increased from 5,500 MW in the February 2023 assessment to the May 2023 assessment based on agency staff assessments of market conditions.

[7] CAISO Historical Year Ahead Resource Adequacy Aggregate Data. http://www.caiso.com/Documents/HistoricalYearAheadResourceAdequacyAggregateData.xlsx.

[8] Estimated online dates for contracted capacity is from the Joint Reliability Planning Assessment - SB 846 Second Quarterly Report, Table 4 (https://efiling.energy.ca.gov/GetDocument.aspx?tn=250176&DocumentContentId=84899). LSE contracting activity may lead to additional resources in the future to meet CPUC requirements and IRP plans.

Lines 8 through 13 represent reductions in the amount of the resources in lines 4 through 7 that may occur for a variety of reasons.

Line 8 represents the derating of thermal generation. Gas-fired generation is typically less efficient when ambient temperatures are high like the conditions expected during peak load. Generators may not be able to produce at their RA value. If they sell more RA than they can actually produce during those periods, they may be subject to financial penalties. To address these penalties, generators may sell less than their rated capacity for gas-fired units.[9]

Line 9 demonstrates the impact of removing Diablo Canyon from the pool of resources capable of providing RA in 2025 and 2026.

Line 10 represents the removal of the once-through-cooling (**OTC**) generating resources from the RA fleet. This may occur due to retirement of the resources to meet OTC regulations or removal of the resources from the RA compliance supply stack by the California Department of Water Resources as part of California's Strategic Reliability Reserve.

Line 11 represents the capacity beyond the RA requirements the Commission has ordered the state's three Investor-Owned Utilities (**IOU**) to procure to provide a higher level of reliability. This line is shown at 1,700 MW for 2024 and 2025 pursuant to a proposed decision in R.21-10-002, representing the minimum targeted procurement defined by the Commission. This authorized procurement goes as high as 3,200 MW for

[9] For thermal plants whose NQC is listed as equivalent to their Net Dependable Capacity, we apply a technology-specific thermal derate estimated from historical ambient temperature derates within the CAISO. Ambient derate data can be found in the CAISO's daily Curtailed and Non-Operational Generator Prior Trade Date Reports: http://www.caiso.com/market/Pages/OutageManagement/CurtailedandNonOperationalGenerators.aspx.

those same years. If procured at higher levels, this would place the deficiencies in Line 15 larger than those depicted in Table 1. While the IOUs are instructed to sell any excess RA positions, this does not change the fact that the demand for these resources is in the market impacting costs and making compliance more complicated.

The Commission has noted the same market scarcity. The May 25, 2023, Proposed Decision in the RA proceeding (R.21-10-002) finds "that increasing the PRM without greater certainty about installed RA resources for 2024 and 2025 is not appropriate at this time."[10] Despite this uncertainty, the Commission has ordered excess PRM procurement by the IOUs, which has the potential to make a tight market condition even tighter. In addition, the California Energy Commission has analyzed grid conditions, although not the RA supply balance. It concluded: "Based on the assumptions discussed (authorized procurement with up to 40 percent annual delay in project development and 5500 MWs of import availability during critical hours), significant grid reliability risks persist through 2030 under conditions experienced in 2020 and 2022."[11]

Line 12 represents the "excess" incremental procurement by the IOUs, as ordered by the Commission for 2023 to increase the "effective" PRM above the actual compliance requirement. For 2024 and 2025, this has been combined with line 11.

[10] R.21-10-002, Proposed Decision (May 25, 2023) https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M509/K800/509800450.PDF.

[11] SB 846 – Diablo Canyon Extension and Clean Energy Reliability Investment Plan at 44 https://efiling.energy.ca.gov/GetDocument.aspx?tn=248455&DocumentContentId=82897.

Line 13 represents the capacity retained by the IOUs, as generators, as "substitution" capacity to mitigate the risk of resource outages that would subject them to financial penalties.[12]

Line 14 is the sum of lines 4 through 13 and represents the total demand for RA capacity.

Finally, line 15 compares the available resources to the demand for those resources. The negative values in 2023 through 2025 represent a deficiency in sufficient resources to meet the RA requirements, while the small positive value in 2026 shows a razor-thin margin.

This analysis looks only at the current peak load-based RA program. In 2025, the Commission will implement a Slice of Day RA[13] mechanism that ensures resource adequacy in all 24 hours of the worst day in each month. Diablo Canyon will be even more essential in this new model since its capacity is available in every hour of the day.

This concludes our testimony.

[12] This assessment relies on the 2021 resources retained by IOUs as reported in the 2021 IOU Excess Resource reports (https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/resource-adequacy-homepage/resource-adequacy-compliance-materials).

[13] CPUC D.22-06-050 and D.23-04-010.

Attachment A

Curriculum Vitae of Eric Little

Eric W. Little

118 Demmer Dr.
Placentia, CA 92870

Business Experience:

Director of Regulatory Affairs, CalCCA
March 2021 – Present

- Interact with Regulatory Agencies (CPUC, CEC, FERC) and the CAISO to advocate on behalf of CCAs
    - Includes stakeholder process, written filings, and ex parte meetings
- Direct a team to develop regulatory strategies on a host of topics that impact the ability of CCAs to reliably, affordably, and cleanly serve customer needs
    - Includes topics such as Utility Rate Cases, Energy Resource Recovery Account, Power Charge Indifference Adjustment, Resource Adequacy, Provider of Last Resort, Demand Flexibility, CEC Load Management System, General Order 156, CAISO Extended Day Ahead Market among many others
- Work with the CCA subject matter experts and CalCCA Board of Directors to examine issues and determine best course of action

Manager, Southern California Edison
Regulatory Affairs May 2007 – May 2011 and January 2012 – March 2021

- Testified in multiple venues including
    - California Senate sub-committee on Resources, Environmental Protection, Energy and Transportation
    - California Public Utilities Commission
- Written and verbal advocacy provided including
    - CAISO Board of Governors
    - FERC proceedings
    - CPUC workshops
- Built and led coalitions of parties to jointly advocate for issues of significant concern
    - e.g. a coalition of Load Serving Entities dedicated to enacting changes to the CAISO Congestion Revenue Rights program that was losing $100 Million per year of ratepayer value
- Led internal project teams to identify changes necessary in the wholesale market to accommodate the changing landscape of energy provision, including:
    - Efforts to more effectively integrate new resource types (e.g. storage) in the CAISO market
    - Consider potentially large and necessary changes to the Resource Adequacy program under a reduction in large central station plants in favor of smaller distributed resources
- Significant involvement in SCE's IRP to address wholesale market and Resource Adequacy issues
- Led external activities to implement GHG accounting
    - Developed the "first deliverer" methodology and "e-tag" evidence to support such methodology
- Developed and implemented a process for GHG reporting
- Led a team to develop necessary changes to the Procurement Plan filed with and approved by the CPUC including:
    - A determination of need comparing loads and resources
    - Evaluation of system need for new generating resources
    - Development of a procurement framework to identify the types of resources to be procured (supply and demand side resources as well as conventional and renewable generation and energy storage)
- Developed and implemented new procedures and documentation to comply with NERC reliability standards
- Led reviews of various activities (e.g. procurement) to ensure compliance with applicable regulation

Manager, California Independent System Operator
Market Design and Regulatory Policy May 2011 – January 2012

- Led development of various market elements
    - Including initiatives to develop the necessary elements to integrate the States 33% Renewables goal
- Worked with the California Air Resources Board to assist with the methodology to identify imports for GHG reporting purposes
- Coached and Mentored team to develop targeted and productive meetings
    - Improved processes for market design review
    - Improved inter- personal communications

- Worked with executive of department to develop a 3-year business plan
    - including refined roles and responsibilities to better align business needs and job skills
- Improved development ladder within the organization to provide for better succession planning
- Defined likely challenges that will be faced with regard to operational and market structures in California

Project Manager, Southern California Edison
Energy Supply & Management May 2005 – May 2007, Transmission and Distribution Apr 1998 – Feb 2002

- Analyzed initiatives at the CPUC and CAISO and developed advocacy positions for a variety of topics
- Deliver (written and verbally) SCE positions at regulatory and pseudo-regulatory agencies such as CARB, CPUC, FERC, and the CAISO

Project Manager, Southern California Edison
Controllers Feb 2002 – May 2005

- Worked with IT and operational organizations to develop an automated system to reconcile usage, revenue, and receivables processes
- Led a cross functional team to develop a billing and collections system for non-energy related activity
- Wrote process and control documentation and served as liaison for Sarbanes-Oxley compliance

Financial Analyst, Southern California Edison
Regulatory Policy and Affairs November 1996 – April 1998

- Developed pricing and sales forecasts through econometric modeling and statistical software
- Developed rate structures for retail customers
- Performed financial analysis on various projects and analyze regulatory requirements for financial and operational impacts

Education:

Master of Arts in Economics
University of California, Santa Barbara, September 1995

Bachelor of Arts in Economics with honors
California State University, Long Beach, December 1993

Attachment B

Curriculum Vitae of Andrew Mills

Andrew D. Mills, Ph.D

California Community Choice Association
One Concord Center, 2300 Clayton Rd. Suite 1150, Concord, CA 94520
andrew@cal-cca.org

EDUCATION

University of California at Berkeley. Ph.D. in Energy and Resources, August 2015. *Application of Power Systems Economics to Wind and Solar Power Integration.* Duncan Callaway (chair), Severin Borenstein, Shmuel Oren

University of California at Berkeley. M.S. in Energy and Resources, May 2006

Illinois Institute of Technology. B.S., Mechanical Engineering, May 2003

EXPERIENCE

CALIFORNIA COMMUNITY CHOICE ASSOCIATION, Concord, CA
Director of Data Analytics, February 2023 – present
Principal Electrical System Modeler, 2021 – 2023

- Manage an analytics and modeling team that provides CalCCA members and decision-makers with data and analysis to ensure a reliable grid at a reasonable cost
- Develop and maintain an electricity market model of the western U.S. grid in PLEXOS
- Analyze the reliability, emissions, and affordability implications of procurement and policy decisions

LAWRENCE BERKELEY NATIONAL LABORATORY, Berkeley, CA
Staff Scientist, Electricity Markets and Policy Department, 2006 - 2021

- Led research on the integration of variable renewable energy into the electric power system and impacts on wholesale power markets
- Disseminated research findings to the broader public through LBNL reports, journal articles, and conference papers
- Provided expert renewable energy assistance to stakeholders including utilities, public utilities commissions, and regional transmission planning groups
- Supervised junior staff and graduate student research assistants

SONOMA STATE UNIVERSITY, Rohnert Park, CA
Lecturer: Electrical Energy Management, August 2007 – December 2007

- Taught upper-division undergraduate course on basics of electricity (DC and AC), energy efficiency, and electric motors

ALL CELL TECHNOLOGIES, LLC, Chicago, IL
Engineering Consultant, 2003 - 2004

- Conducted research on passive thermal management system for lithium-ion battery packs
- Fabricated and analyzed a graphite matrix to increase thermal conductivity of phase change materials

SELECTED HONORS AND AWARDS

- Contributing Author, Working Group III contribution to the IPCC Fifth Assessment Report, 2012

- Utility Variable-Generation Integration Group 2012 Annual Achievement Award, 2012
- Contributing Author, IPCC Special Report on Renewable Energy, 2009
- National Science Foundation Graduate Research Fellowship, 2004

SELECTED PRESENTATIONS

- Presented via in-person and webinar on more than 75 occasions at industry conferences, academic conferences, and regulatory workshops.

- National Association of State Utility Consumer Advocates Training (October 2020)
- IEA Wind Task 11 Technical Expert Meeting #101 (August 2020)
- Energy Systems Integration Group, Spring Technical Workshop (April 2020)
- North Carolina Public Utilities Commission Storage Workshop (January 2020)
- IAEA: Economics of Flexible Operation in Nuclear Power Plants (December 2019)
- Ascend Analytics Summit (October 2019)
- Energy Systems Integration Group, Fall Technical Workshop (October 2019)
- Rutgers Center for Research on Regulated Industries Advanced Workshop in Regulation and Competition (June 2019)
- Institute of Public Utilities Grid Power School (April 2019)
- Arizona Public Service IRP Stakeholder Meeting (March 2019)
- Energy Systems Integration Group, Spring Technical Workshop (March 2019)
- National Council on Electricity Policy Webinar (February 2019)
- EPRI 37th Annual Seminar on Fuels, Power Markets, and Resource Planning (November 2018)
- AWEA Executive Summit (November 2018)
- Navy Postgraduate School Defense Energy Seminar (August 2018)
- Western Interstate Energy Board Resource Planners Forum (June 2018)
- National Association of State Utility Consumer Advocates Mid-Year Meeting (June 2018)
- GreenTech Media: US Power & Renewables Summit 2017 (November 2017)
- Oregon CUB Utility Regulation 2.0: Empowering What's Possible (October 2017)
- NECPUC Distribution Systems & Planning Training (September 2017)
- National Council of State Legislatures "Solar Boot Camp" (August 2016)
- NERC Workshop on Distributed Energy Resources (August 2016)
- Georgia Public Service Commission Workshop on Renewables Valuation (October 2015)
- Oregon Public Utilities Commission Workshop on Renewable Generator's Contribution to Capacity (August 2015)
- Kentucky DER Valuation Workshop (April 2015)
- EIA Workshop on International Energy Modeling (January 2015)
- Northwest Power and Conservation Council (March 2014)
- Keynote at Oregon Citizens Utility Board Policy Conference (October 2013)
- 18th Annual POWER Conference on Energy Research and Policy, Haas Energy Institute (March 2013)
- Committee on Regional Electric Power Cooperation and State and Provincial Steering Group Webinar (March 2012)
- 16th Annual POWER Conference on Energy Research and Policy, Haas Energy Institute (March 2011)

SELECTED PUBLICATIONS

- Co-authored more than 90 publications including peer-review journal articles, Berkeley Lab reports, and magazine articles: https://orcid.org/0000-0002-9065-0458

1. Kim, J.H., M. Bolinger, A.D. Mills, and R. Wiser. 2023. "Rethinking the Role of Financial Transmission Rights in Wind-Rich Electricity Markets in the Central US." The Energy Journal 44, no. 6. https://doi.org/10.5547/01956574.44.6.jkim
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3. Crespo Montañés, C., W. Gorman, A.D. Mills, J.H. Kim, 2022. "Keep it short: Exploring the impacts of configuration choices on the recent economics of solar-plus-battery and wind-plus-battery hybrid energy plants." *Journal of Energy Storage*, 50:104649, https://doi.org/10.1016/j.est.2022.104649.
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5. Seel, J., C. Warner, and A. Mills. 2022. "Influence of business models on PV-battery dispatch decisions and market value: A pilot study of operating plants." Advances in Applied Energy 5:100076. https://doi.org/10.1016/j.adapen.2021.100076
6. Kim, J.H., A.D. Mills, R. Wiser, M. Bolinger, W. Gorman, C. Crespo Montañes, and E. O'Shaughnessy. 2021. "Project Developer Options to Enhance the Value of Solar Electricity as Solar and Storage Penetrations Increase." *Applied Energy* 304:117742. https://doi.org/10.1016/j.apenergy.2021.117742.
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9. Mills, A., Wiser, R., Millstein, D., Carvallo, J.P., Gorman, W., Seel, J., Jeong, S. 2021. "The Impact of Wind, Solar, and Other Factors on the Decline in Wholesale Power Prices in the United States". *Applied Energy.* 283 (February): 116266 https://doi.org/10.1016/j.apenergy.2020.116266
10. Ela, E., Mills, A., Gimon, E., Hogan, M., Bouchez, N., Giacomoni, A., Ng, H., Gonzalez, J. and DeSocio, M., 2021. "Electricity Market of the Future: Potential North American Designs Without Fuel Costs." *IEEE Power and Energy Magazine*, *19* (1)
11. Darghouth, N.R., G. Barbose, J. Zuboy, P.J. Gagnon, A.D. Mills, and L. Bird. 2020. "Demand charge savings from solar PV and energy storage." *Energy Policy* 146: 111766.
12. Mills, A. D., and P. Rodriguez. 2020. "A Simple and Fast Algorithm for Estimating the Capacity Credit of Solar and Storage." *Energy* 210: 118587. https://doi.org/10.1016/j.energy.2020.118587.

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14. Gorman, W., A. Mills and R. Wiser. 2019. "Improving estimates of transmission capital costs for utility-scale wind and solar projects to inform renewable energy policy." *Energy Policy* 135: 110994.
15. Seel, J., A. D. Mills, and R. H. Wiser. 2018. *Impacts of High Variable Renewable Energy Futures on Wholesale Electricity Prices, and on Electric-Sector Decision Making.* Berkeley, CA: Lawrence Berkeley National Laboratory. https://doi.org/10.2172/1437006
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Attachment C

CalCCA Stack Analysis

CALCCA
ADVANCING LOCAL ENERGY CHOICE

CALIFORNIA'S CONSTRAINED RESOURCE ADEQUACY MARKET: RATEPAYERS LEFT STANDING IN A GAME OF MUSICAL CHAIRS

Updated March 20, 2023

1. Introduction

The Resource Adequacy (RA) supply available within the California Independent System Operator (CAISO) balancing area for 2023 appears inadequate to meet the RA program compliance requirements. The "stack" analysis in Figure 1 below, which compares RA requirements with the available RA supply, demonstrates that the margin is razor thin "on paper."[1] The recent Joint Agency Reliability Planning Assessment by the California Energy Commission (CEC) and California Public Utilities Commission (CPUC), which is based on an hourly analysis of anticipated supply and projected demand, roughly substantiates this conclusion. When the stack analysis is viewed in the context of regulatory dynamics and Western market constraints, however, the razor-thin margin becomes a material supply deficiency.

A wide range of factors have contributed to these conditions:

- Weather conditions are more extreme, increasing load and reducing generation output.
- Hydro resource availability has declined under drought conditions.
- New resources are delayed due to permitting, interconnection, and supply chain challenges.
- The entire Western region is constrained, reducing the availability of imports to California[2] and risking increased exports of California resources to meet other Western region requirements (*e.g.,* Western Resource Adequacy Program (WRAP)).
- CPUC reduction in effective load carrying capacity values reduced reliance on wind and solar resources to meet RA requirements.
- CPUC's increase in planning margins (PRMs) to 16%, with a 20-22.5% "effective" PRM for investor-owned utilities (IOUs), increased RA requirements.
- CPUC's definition of "incremental" procurement to meet the effective PRM encouraged IOUs to cannibalize the existing RA resource stack, reducing supply for other LSEs.
- Unnecessarily restrictive requirements for energy imports under the CPUC's RA program reduced the availability of imports to the CPUC-jurisdictional RA market.

The RA supply deficiency will prevent collective compliance by CAISO load-serving entities (LSEs) despite their best efforts to procure and willingness to pay exorbitant prices. Some LSEs subject to the CPUC's RA program were unable to obtain enough supply to comply with their

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[1] The stack analysis focuses on the sufficiency of supply to enable load-serving entities to comply with RA program requirements and does not analyze the likely sufficiency of energy to meet Summer 2023 needs.

[2] Historical RA import data from the CAISO demonstrates that the amount of imports in year-ahead RA showings declined from 5,900 MW in 2020 to 3,600 MW in 2022. RA imports from unspecified declined from 4,300 MW to 1,300 MW over the same period. Historical year-ahead RA data: http://www.caiso.com/Documents/HistoricalYearAheadResourceAdequacyAggregateData.xlsx.

year-ahead RA compliance requirements despite numerous formal solicitations and substantial bilateral outreach. Recent experience suggests the problem will only grow in the month-ahead RA compliance process absent a substantial increase in hydro output, imports, or expedited deployment of new resources.

Not all LSEs start the game with the same odds. IOUs hold most "legacy" supplies built prior to the recent growth of community choice aggregation (CCA) and the expansion of Direct Access (DA). As CCA or DA load has departed the IOU portfolio, the IOUs have retained for their remaining bundled load the supply previously procured for the departed load. Consequently, as conditions have changed, the burden of finding new supply to meet requirements has shifted largely to CCA and DA customers. The challenges in getting new steel in the ground thus have had a graver effect on these customers.

Under these conditions, RA program compliance has become a game of musical chairs: some chairs are occupied by the IOUs and some have been grabbed by out-of-state entities, leaving some California LSEs without a chair when the music stops. Until more new resources come online, the race to find a chair in the game will have detrimental consequences for all consumers. The RA shortfall has driven up prices paid by consumers. Resources that garnered $3.63 kilowatt (kW)-month in 2019[3] rose to prices as high as the mid-$40 kW-month for summer 2023 and are increasingly unavailable at any price. Sellers are the only market participants who benefit from this pressure.

RA penalties for LSEs unable to secure supply in a deficient market do nothing to get new resources in the ground; they unnecessarily add to customer costs and indirectly increase the cost of supply. Resource development is properly addressed in the CPUC's Integrated Resource Planning process and procurement mandates.

2. RA Supply/Demand Balance: 2023 RA Stack Analysis

The RA stack analysis in Figure 1 below compares the demand for system RA for peak months in 2023 to the total supply of RA, including RA from resources in the CAISO footprint and estimated RA imports. RA supply is primarily derived from the CAISO's net qualifying capacity list, while RA demand is the forecasted median load in the CAISO plus a planning reserve margin.

As shown in Figure 1 below, demand for RA exceeds the available supply of RA, even after accounting for imports and expected addition of resources, in three of the four peak summer months. The projected deficit is nearly 1,400 megawatts (MW) in September 2023. The scarcity of supply makes it difficult, if not impossible, for every LSE to meet its RA requirements.

[3] https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/resource-adequacy-homepage/2019rareport-1.pdf, at 22.

Figure 1

		Jun	Jul	Aug	Sep
1	CAISO 1-in-2 Load	42,056	45,397	45,922	46,819
2	Reserve Margin (16%)	6,729	7,264	7,347	7,491
3	**Total RA Demand**	**48,786**	**52,661**	**53,269**	**54,310**
4	Owned by Calpine	5,874	5,864	5,861	5,867
5	Owned by AES	3,657	3,657	3,655	3,655
6	Owned by NRG	2,321	2,317	2,315	2,322
7	Owned by Other	36,426	36,843	36,124	35,460
8	Event-Based Demand Response	995	1,045	1,077	1,090
9	Imports	5,500	5,500	5,500	5,500
10	Thermal Plant Derate	(726)	(726)	(726)	(726)
11	Excess IOU Resources Above PRM (D.21-12-015)	(794)	(925)	(664)	(206)
12	Supply-Side Emergency Reliability Procure. (D.21-12-015)	(883)	(933)	(824)	(1,125)
13	Retention for Substitution	(619)	(619)	(619)	(619)
14	**Total RA Supply**	**51,751**	**52,023**	**51,699**	**51,218**
15	Surplus Supply (Deficit)	2,966	(638)	(1,570)	(3,092)
16	Expected New Resources	-	-	1,695	1,695
17	Surplus Supply (Deficit) with New	2,966	(638)	125	(1,397)

3. Sources and Explanation of the RA Stack

Figure 1 uses both familiar data in assessing RA supply sufficiency and also integrates information not typically considered in a supply analysis. This information, reflected in rows 11 through 13, stems from regulatory changes implemented by the CPUC that had the effect of eroding supply available to other LSEs. The table below documents the sources of data used in Figure 1.

Row(s)	Source
1	CAISO 1-in-2 Load Forecast. Monthly peak demand forecast for a median (1-in-2) weather year from the CPUC.[4]
2	Planning Reserve Margin per CPUC D.22-06-050[5]
4-7	California ISO NQC List. The CAISO lists the net qualifying capacity (NQC) for all resources in the CAISO footprint for 2023.[6] We identify the plant owner by matching the resource identification number (resource ID) in the NQC list to the resource ID in the CAISO Master Generating List.[7] Three companies (Calpine, AES, and NRG) and their affiliates own nearly 12 GW (over 20%) of NQC.

[4] CPUC's 2023 Forecast Summary Tables: https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/resource-adequacy-homepage/resource-adequacy-compliance-materials/ra-2023-forecast-summary-tables.xlsx.

[5] D.22-06-050, *Decision Adopting Local Capacity Obligations For 2023 - 2025, Flexible Capacity Obligations For 2023, and Reform Track Framework*, R.21-10-002 (June 23, 2022): https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M488/K540/488540633.PDF.

[6] CAISO 2023 NQC List: https://www.caiso.com/Documents/2023-net-qualifying-capacity-values-for-resource-adequacy-resources.html.

[7] CAISO Master Control Area Generating Capability List: oasis.caiso.com.

Row(s)	Source
8	Event-Based Demand Response. Demand response quantities are from the CPUC's Resource Adequacy Compliance Materials.[8] Demand response totals include avoided losses and are from event-based programs at PG&E, SCE, and SDG&E.
9	Imports. Imports reflect the CEC's assumed RA imports available to the CAISO market.[9]
10	Thermal Plant Derate. Many thermal generators cannot produce maximum output at certain temperatures, leading to plant derates. For this reason, resource owners may not sell their full NQC as RA capacity. For thermal plants whose NQC is listed as equivalent to their Net Dependable Capacity, we apply a technology-specific thermal derate estimated from historical ambient temperature derates within the CAISO.[10] Our approach parallels recent CPUC discussions regarding the need to include thermal derates in reliability modeling.[11]
11	D.21-12-015 allowed: "excess resources from an IOU's *existing* portfolios may be used to meet or supplement these procurement targets up to the upper end of its contingency procurement target."[12] Line 11 represents the total of the three IOUs' excess resources from their portfolios as filed in the IOU 2022 Excess Resources Report.[13]
12	D.21-12-015 authorized the IOUs to "continue their procurement efforts and endeavor to meet and exceed their respective incremental procurement targets to achieve the range of additional procurement authorized in this decision for months of concern… As noted previously, a combination of RA eligible and non-eligible resources will be used to meet the contingency procurement target range."[14] While these resources were intended to be incremental to supply available to LSEs to meet their 16% requirement, a significant amount appears to erode existing supply.[15] This erosion occurs because many of the resources are qualified to provide RA and, were it not for the IOU procurement, could provide RA to other LSEs to meet their RA compliance requirements.[16]

[8] 2023-2025 Demand Response Totals: https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/resource-adequacy-homepage/resource-adequacy-compliance-materials.

[9] Joint Agency Reliability Planning Assessment - SB 846 Quarterly Report and AB 205 Report, at 43: https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=21-ESR-01.

[10] Ambient derate data can be found in the CAISO's daily Curtailed and Non-Operational Generator Prior Trade Date Reports: http://www.caiso.com/market/Pages/OutageManagement/CurtailedandNonOperationalGenerators.aspx.

[11] ED Staff Proposal for Derating Thermal Power Plants based on Ambient Temperature: https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/resource-adequacy-homepage/r21-10-002/4_ed-proposal-for-phase-3-derates.pdf.

[12] D.21-12-015 at 103

[13] https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/resource-adequacy-homepage/resource-adequacy-compliance-materials.

[14] D.21-12-015 at 101-102.

[15] The additional resources procured under this authorization are described in the CPUC's RA materials with additional detailed provided in advice letters filed by the IOUs. 2022 IOU Excess Resource reports: https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/resource-adequacy-homepage/resource-adequacy-compliance-materials.

[16] CalCCA used the amounts in the IOU reports and removed those resources that would not otherwise qualify for RA (*e.g.*, Emergency Load Reduction Program). The resources included in row 12 include firm energy imports, additional RA contracts, tolling agreements, extension of existing contracts that are RA eligible, and contracts for increased output where the efficiency upgrades likely could have been financed by an RA contract with an LSE.

Row(s)	Source
13	Retention for substitution. IOUs are entitled to retain RA beyond their bundled needs for substitution during planned outages. While 2022 data are not yet available, this assessment relies on the 2021 resources retained by IOUs as reported in the 2021 IOU Excess Resource reports.[17]
16	Expected new-build resources online by 8/1/23. Resources mandated by the CPUC pursuant to D.19-11-016 and D.21-06-035 assuming a 40% delay and/or failure rate.

4. Tight Conditions Are Likely to Persist Through 2026

Extending the RA stack for September through 2026, Figure 2 below shows that the tight market conditions continue. The challenge of meeting RA requirements is exacerbated by rising load, increasing planning reserve margins, and retirement or removal from the RA market of resources like Diablo Canyon Power Plant (DCPP) and several once-through cooling plants. Deployment of new capacity to meet the CPUC's procurement requirements helps, though projects are likely to be delayed at least in the next few years. Though not reflected here, the RA market will undergo a fundamental shift in design, changing to a 24-hour slice of day approach starting in 2025.[18]

The sources and assumptions in this extended stack analysis are similar to the 2023 stack in Figure 1, with the following exceptions:

- The load forecast for 2024-26 is based on the CEC's 2022 Integrated Energy Policy Report Planning scenario;[19]
- The planning reserve margins for 2024-2026 increase to 17%;[20]
- In line with the assumptions of the Joint Agency Reliability Planning Assessment, described in the next section, DCPP is retired in 2025 and the remaining once-through-cooling plants are assumed to be procured by DWR[21] and
- Excess IOU procurement for a higher effective PRM continues through 2025.[22]

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17 https://www.cpuc.ca.gov/industries-and-topics/electricalenergy/electric-power-procurement/resource-adequacy-homepage/resource-adequacy-compliancematerials.

18 D.22-06-050 at 128.

19 CEC's California Energy Demand 2022 Hourly Forecast for the CAISO region with the Planning Scenario, based on the monthly maximum of the CAISO Managed Net Load: https://efiling.energy.ca.gov/GetDocument.aspx?tn=248359&DocumentContentId=82768.

20 D.22-06-050 at 125 requires a 17% PRM for 2024, we assume the same for 2025-26.

21 The capacity of once-through-cooling plants at risk of retirement is based on the CAISO's Announced Retirement and Mothball List: http://www.caiso.com/planning/Pages/ReliabilityRequirements/Default.aspx.

22 R.21-10-002, Appendix A, *Energy Division Proposals for Proceeding R.21-10-002* (Jan. 20, 2023), at 7: As part of Proposal 1, Energy Division staff propose to retain the 17% PRM while also extending the effective PRM through 2025 at a level of 3% of the forecasted peak load. https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M501/K407/501407493.PDF.

Figure 2

	September NQC	2023	2024	2025	2026
1	CAISO 1-in-2 Load	46,819	47,475	47,987	48,487
2	Reserve Margin (16% in '23, 17% after)	7,491	8,071	8,158	8,243
3	**Total RA Demand**	**54,310**	**55,546**	**56,145**	**56,730**
4	2023 NQC List	47,304	47,304	47,304	47,304
5	Event-Based Demand Response	1,090	1,105	1,111	1,111
6	Imports	5,500	5,500	5,500	5,500
7	Estimate of Incremental Authorized Procurement	1,695	6,505	9,725	10,325
8	Thermal Derates from 2023 NQC List	(726)	(726)	(726)	(726)
9	Remove Diablo from Planning	-	-	(2,280)	(2,280)
10	OTC, Retired or Contracted by DWR	-	(3,692)	(3,692)	(3,692)
11	Excess IOU Procurement for Higher Effective PRM	(1,331)	(1,424)	(1,440)	-
12	Retention for Substitution	(619)	(619)	(619)	(619)
13	**Total RA Supply**	**52,913**	**53,953**	**54,883**	**56,922**
14	Surplus Supply (Deficit)	(1,397)	(1,593)	(1,262)	192

5. Results Generally Align with Joint Agency Reliability Assessment.

The Joint Agency Reliability Planning Assessment, issued on February 9, 2023, assessed hourly supply sufficiency across each year between 2023-2032. Here we focus on the Joint Agency results during critical hours in the month of September 2023-2026 using their assumption that new resources are based on ordered procurement with a delay rate of 40%. This assessment differs from the CalCCA assessment above because it focuses on hourly supply sufficiency, rather than RA sufficiency for compliance purposes. Consequently, the Joint Agency assessment:

- Projects a higher percentage of completion of new resources by August 1, 2023 (1,750 MW vs. 1,695 MW);
- Uses hourly production of wind and solar on peak demand days, resulting in a contribution of 1,819 MW from wind and solar to meeting demand in Hour 19 of September, compared to the 2,359 MW of wind and solar NQC in the RA stack;
- Uses demand response estimates that may include programs that are not typically used to meet RA requirements;
- Assumes the full contribution of thermal plants are available each hour without accounting for ambient thermal derates associated with high temperatures;
- Does not need to consider the effect of the IOUs' retention of capacity for substitution, since those resources will be available supply unless they are actually substituted for a resource on outage;
- Does not need to consider the effect of the IOUs' incremental "effective" PRM procurement; although the supply may not be available to LSEs to meet their RA requirements, the resources will be a part of the actual supply.

Despite these differences, which tend to present a more positive view of supply, the assessment shows a very tight supply margin, for Hour 19 in September – arguably the most challenging hour to meet. The Joint Agency assessment is summarized below in Figure 3, which was prepared by CalCCA using Joint Agency data.[23]

Figure 3

	Hour 19 Assessment in the Month of September	2023	2024	2025	2026
1	CAISO 1-in-2 Load	46,827	47,472	47,933	48,424
2	Reserve Margin (16% in '23, 17% after)	7,492	8,070	8,149	8,232
3	**Total Hourly Demand**	**54,319**	**55,542**	**56,082**	**56,656**
4	Existing Resources Except Wind and Solar	44,817	44,817	44,817	44,817
5	Supply from Wind	1,810	1,810	1,810	1,810
6	Supply from Solar	9	9	9	9
7	Estimated Completion of CPUC Mandated Procurement	1,750	6,431	10,381	11,755
8	Demand Response	1,274	1,274	1,274	1,274
9	Imports	5,500	5,500	5,500	5,500
10	Remove Diablo from Planning	-	-	(2,280)	(2,280)
11	OTC, Retired or Contracted by DWR	-	(3,757)	(3,757)	(3,757)
12	**Total Hourly Supply**	**55,159**	**56,084**	**57,753**	**59,128**
13	Surplus Supply (Deficit)	840	542	1,672	2,472
14	Incremental Demand with 2020 Equivalent Event	3,044	2,611	2,636	2,663
15	Add'l. Incremental Demand with 2022 Equivalent Event	1,639	1,662	1,678	1,695
16	Surplus Supply (Deficit) with Extreme Weather	(3,843)	(3,731)	(2,642)	(1,887)

6. Conclusion

The supply of Resource Adequacy is insufficient to meet 2023 demand. This insufficiency made it impossible for all LSEs to comply with year-ahead requirements, and the insufficiency likely will carry into month-ahead compliance requirements absent a significant increase in hydro RA availability. The only durable solution is to bring new resources online, yet new resources continue to face supply chain, interconnection, and permitting challenges. Until those challenges are met holistically, RA supply will remain tight and prices paid by consumers will remain high.

Five interim actions should be considered.

1) Recognize the RA supply insufficiency and its consequences in the CPUC's next RA decision.

[23] CalCCA created the table from the underlying data used in the Joint Reliability Planning Assessment (https://efiling.energy.ca.gov/GetDocument.aspx?tn=248714&DocumentContentId=83233 consistent with a conversation with CEC staff on Jan. 31, 2023.

2) Establish a "safety valve," through a discretionary waiver structure for LSEs left deficient in meeting their requirements despite best efforts, to prevent the exercise of market power by suppliers.
3) Increase the likelihood that California LSEs can secure imports for RA compliance by increasing the CPUC-imposed energy market bid cap on imports – currently set at $0/MWh -- to reduce sellers' risk of financial loss.
4) Prevent erosion of the supply stack available to LSEs to meet their RA requirements by limiting any IOU "effective PRM" procurement to truly incremental, non-RA resources.
5) Increase market transparency by providing aggregated compliance data to reveal (a) trends in the categories of resources (e.g., imports, storage) used for compliance and (b) the extent of California resource exports.