Welcome to

REFLECT & RECHARGE 2023

An end of year event to highlight industry-wide impacts and explore future trends.

December 13, 2023
Cupertino Community Hall

SILICON VALLEY CLEAN ENERGY

REFLECT & RECHARGE 2023

CHAIR GEORGE TYSON

Councilmember,
Los Altos Hills

Opening Welcome

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State of Building Decarbonization

PANAMA BARTHOLOMY
Founder & Executive Director,
Building Decarbonization Coalition

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California's Clean Energy Vision, an Electric Fireside Chat

STATE SENATOR
DAVE CORTESE

STATE SENATOR
JOSH BECKER

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PATHWAY TO 2045

ARNE OLSON
Partner, E3

SILICON VALLEY CLEAN ENERGY

California's Pathway to 2045

Silicon Valley Clean Energy Reflect and Recharge Event

Cupertino, California

December 13, 2023

Energy+Environmental Economics

Arne Olson, Senior Partner

“Four Pillars” of decarbonization point to the crucial role of the electricity sector

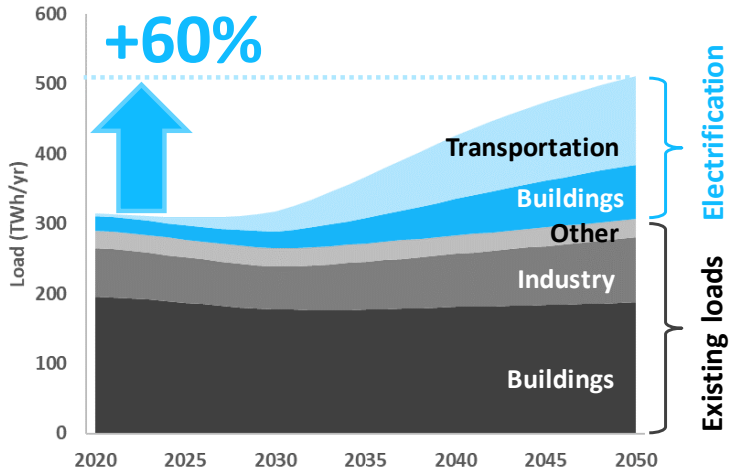
Energy efficiency & conservation

Electrification

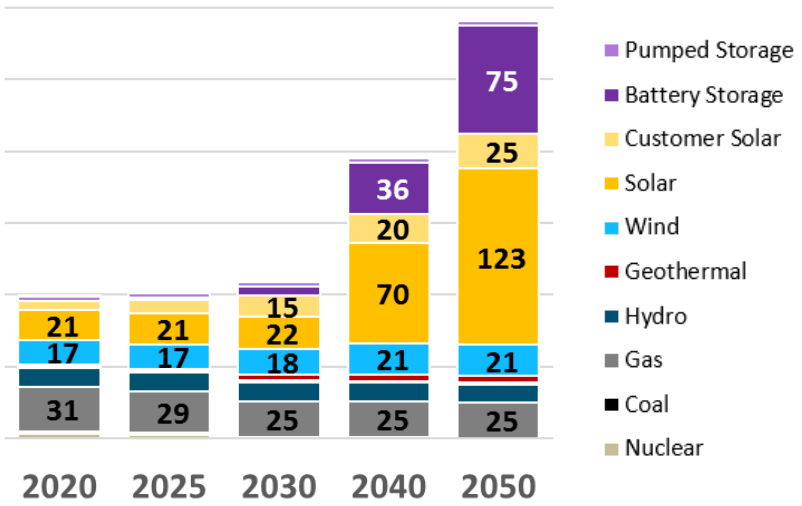
Low carbon electricity

Low carbon fuels

California Electric Loads under Deep Carbon Reductions

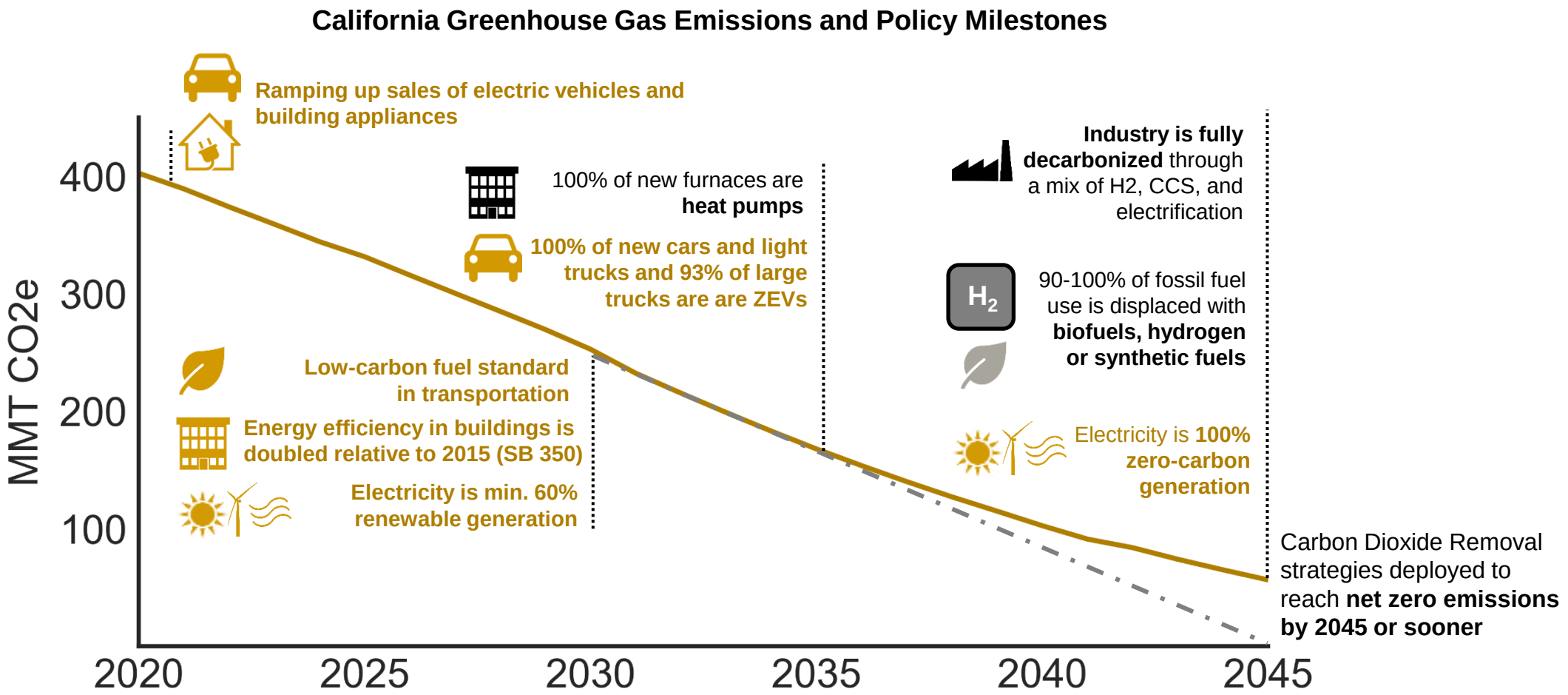


California Electric Resources under Deep Carbon Reductions



Clean electricity displaces fossil fuels as the main source of primary energy

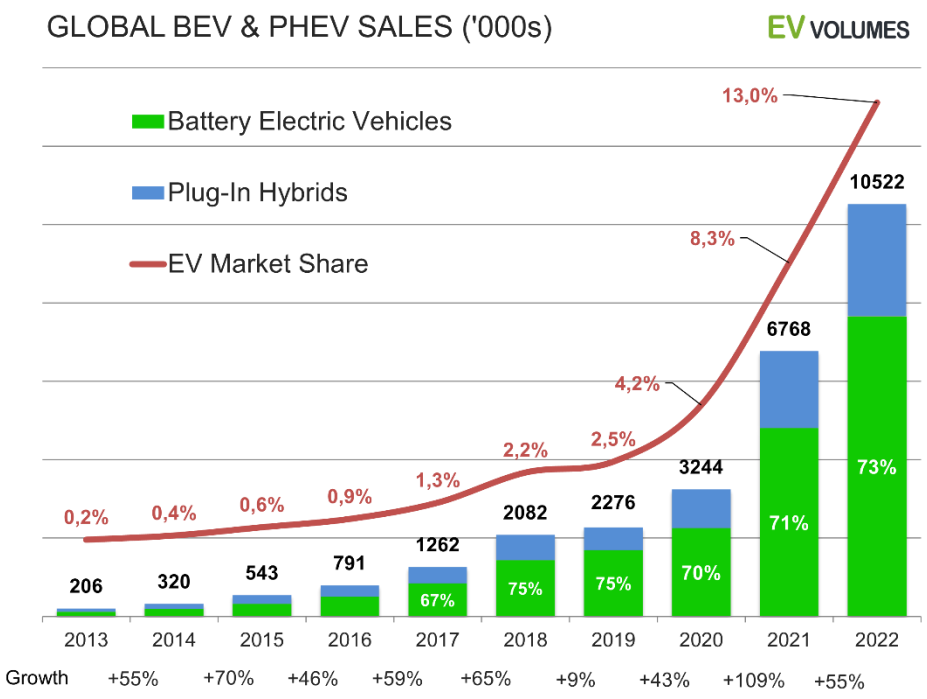
California's aggressive climate goals will require sustained action from every sector of the economy

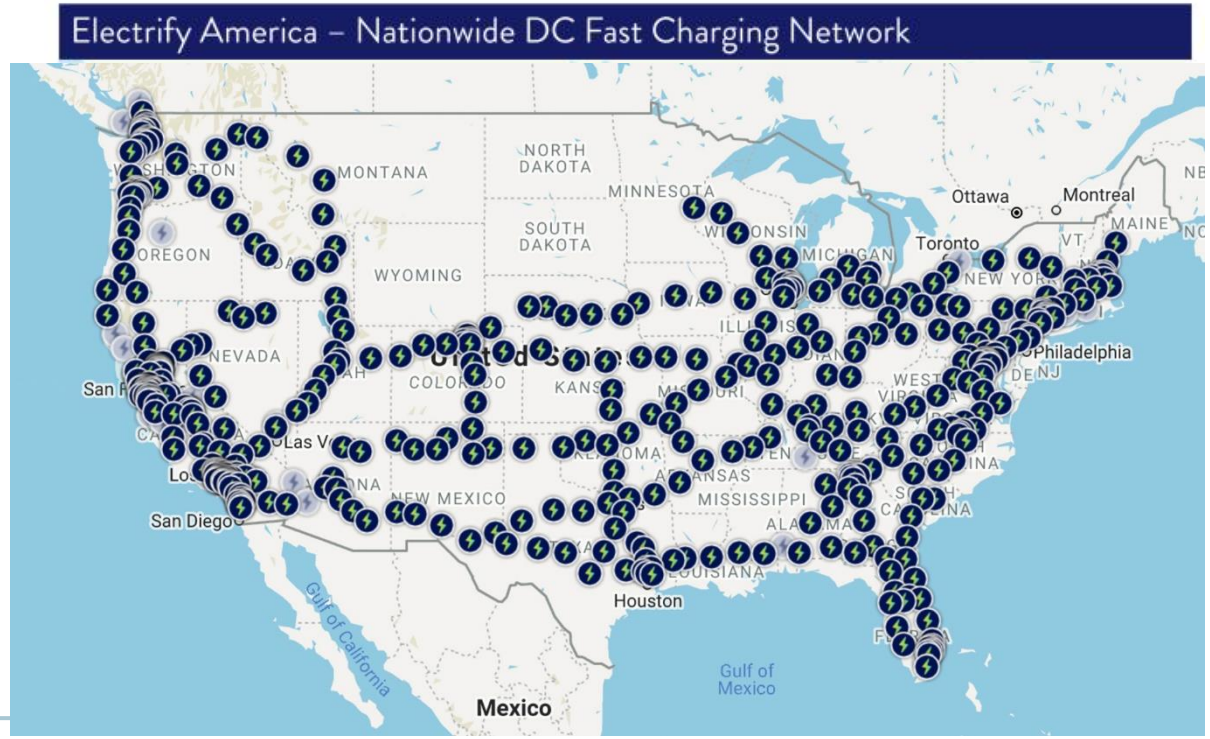


Source: https://ww2.arb.ca.gov/our-work/programs/carbon-neutrality/carbon-neutrality-meetings-workshops

Adoption of light duty electric vehicles is accelerating rapidly

- **Vehicle charging load will be become noticeable in the *NEXT FEW YEARS***
- **Initial adoption likely to be concentrated in certain locations creating *DISTRIBUTION CHALLENGES***
- **Utilities will need to be ready for *SMART CHARGING* rates, panel installations, charging stations, etc.**

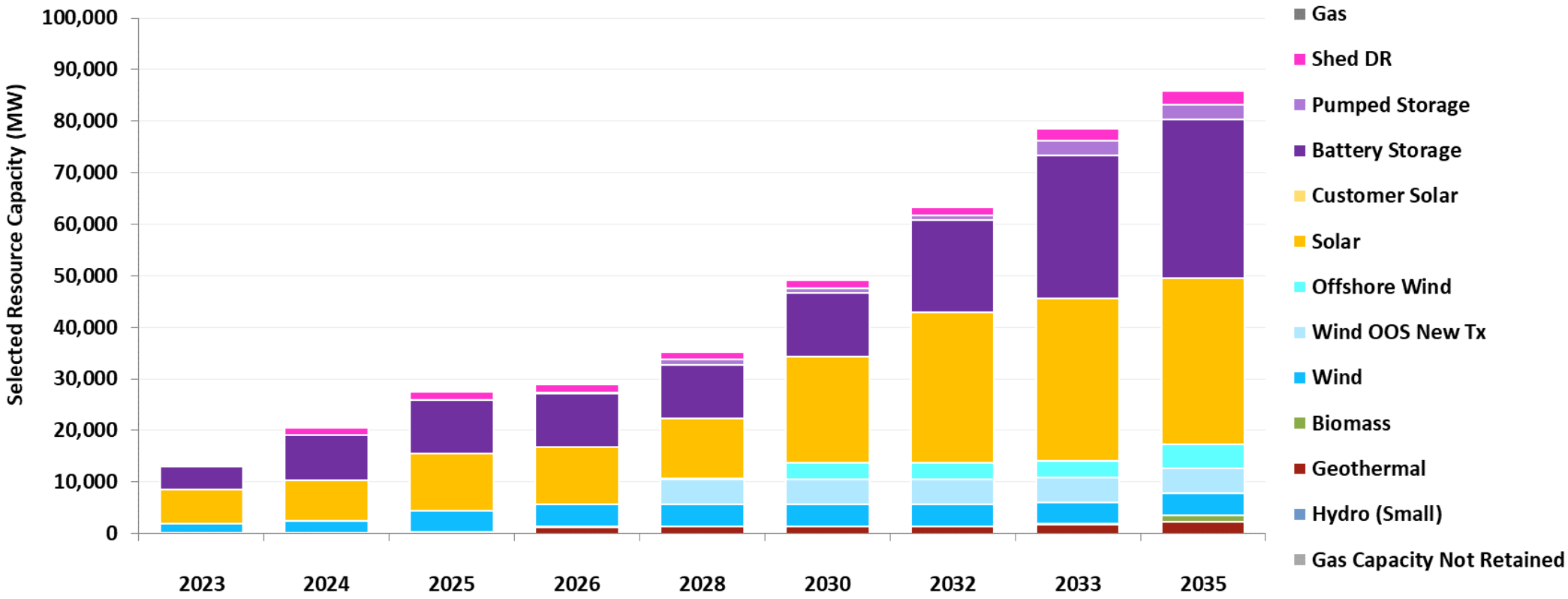




https://www.ev-volumes.com/news/global-ev-sales-for-2022/

One vision of California's clean electricity future

- **CPUC IRP is showing large amounts of new solar and battery storage over the next ten years**
- **A diversity of resources will be needed over the long run**
  - Onshore wind, offshore wind, geothermal, hydrogen, gas generation with carbon capture and sequestration



Increased digitization and onshoring are creating renewed industrial demand growth

MENU Micron

September 12, 2022 at 11:15 AM EDT

Micron Breaks Ground on Leading-Edge Manufacturing Fab in Boise, Idaho

Company celebrates initiation of historic $15 billion investment; construction expected to begin early in 2023, with DRAM production slated for second half of the decade

BOISE, Idaho, Sept. 12, 2022 (GLOBE NEWSWIRE) -- Micron Technology, Inc. (NASDAQ: MU), one of the world's largest semiconductor companies and the only U.S.-based manufacturer of memory, broke ground on its leading-edge memory manufacturing fab in Boise, Idaho. This will be the first new memory manufacturing fab in the United States in 20 years. Micron marked the occasion with a

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JOBS

Intel to add 2 factories to its Chandler campus; $20B investment in Arizona will create thousands of jobs

Russ Wiles
Arizona Republic

Published 3:33 p.m. MT March 23, 2021 | Updated 6:04 p.m. MT March 23, 2021

View Comments

intel Intel Unleashed: Engineering the Future

TRANSPO / ELECTRIC CARS / CARS

GM, Hyundai announce EV battery plants for the US

/ GM is teaming up with South Korea's Samsung SDI, while Hyundai said it would create a joint venture with SK On. The new factories are the latest in a rapidly expanding EV manufacturing footprint in the US.

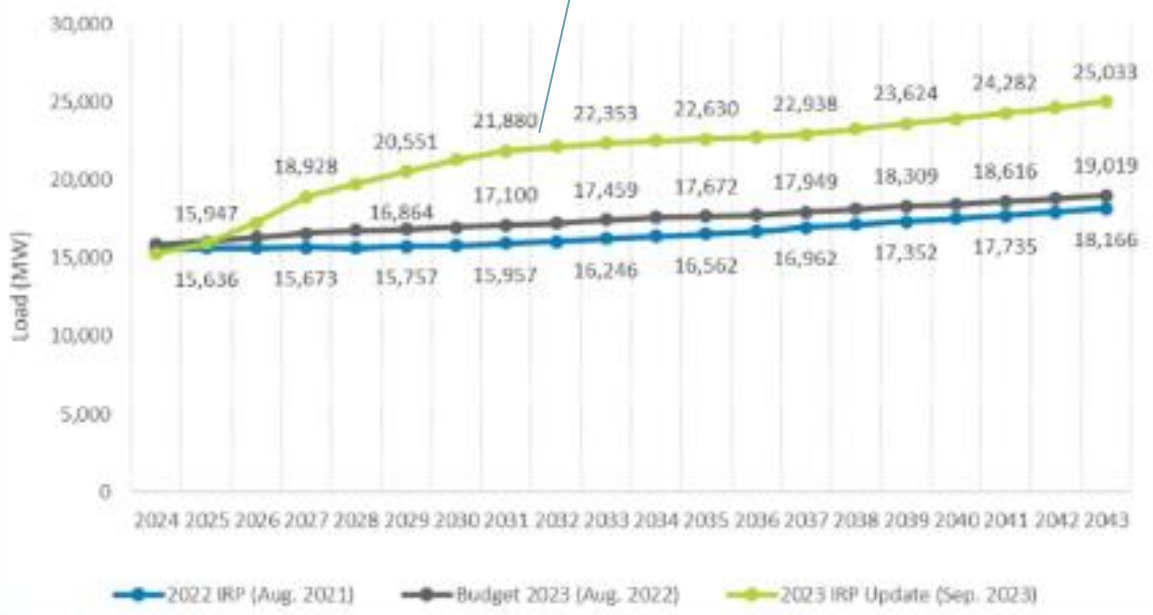
By Andrew J. Hawkins, transportation editor with 10+ years of experience who covers EVs, public transportation, and aviation. His work has appeared in The New York Daily News and City & State.

Apr 25, 2023, 10:04 AM PDT | 4 Comments / 4 New

November 2023: Georgia Power increased 2031 load forecast by *40% or 6 GW* compared to previous forecast

2023 IRP Update load forecast for the 20-year period spanning the winter of 2023/2024 through the winter of 2042/2043.[20]

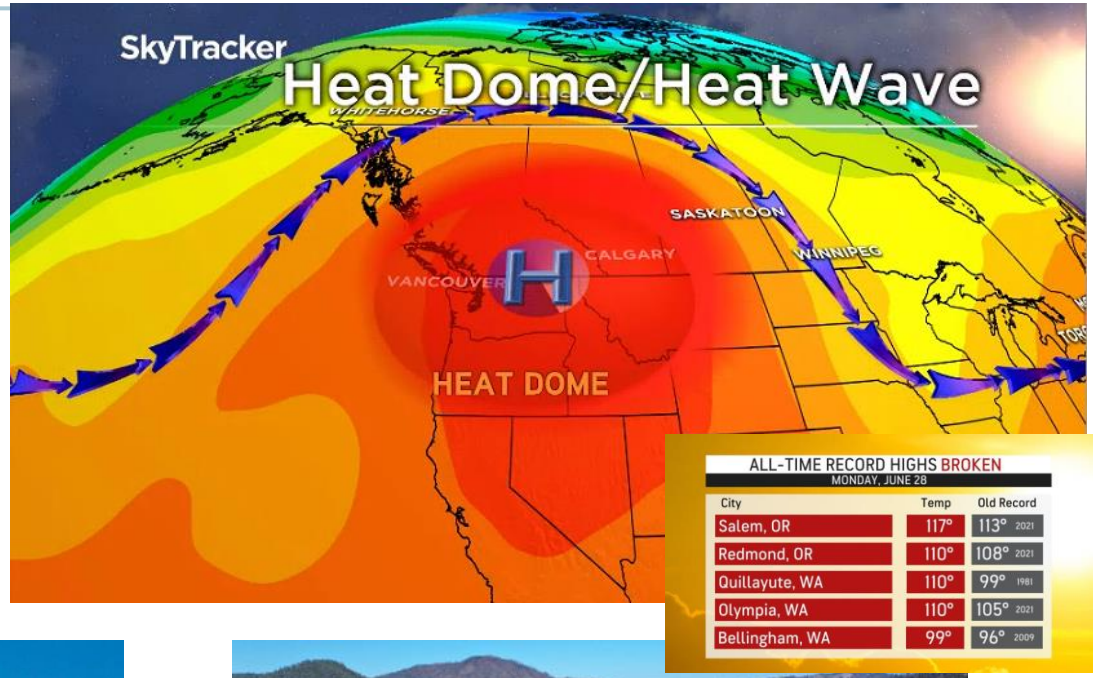
Figure 3: Georgia Power Projected Winter Peak Demand



SOURCES | Georgia Power Company, 2023 Integrated Resource Plan Update (February 24, 2023), pp. 6-10, and the *Load and Energy Forecast* Technical Appendix.

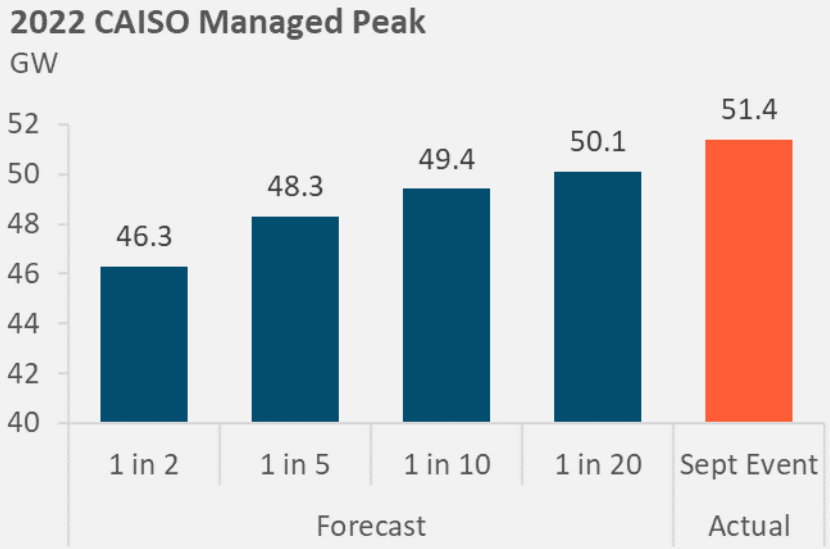
A changing climate is creating significant challenges for electric utilities

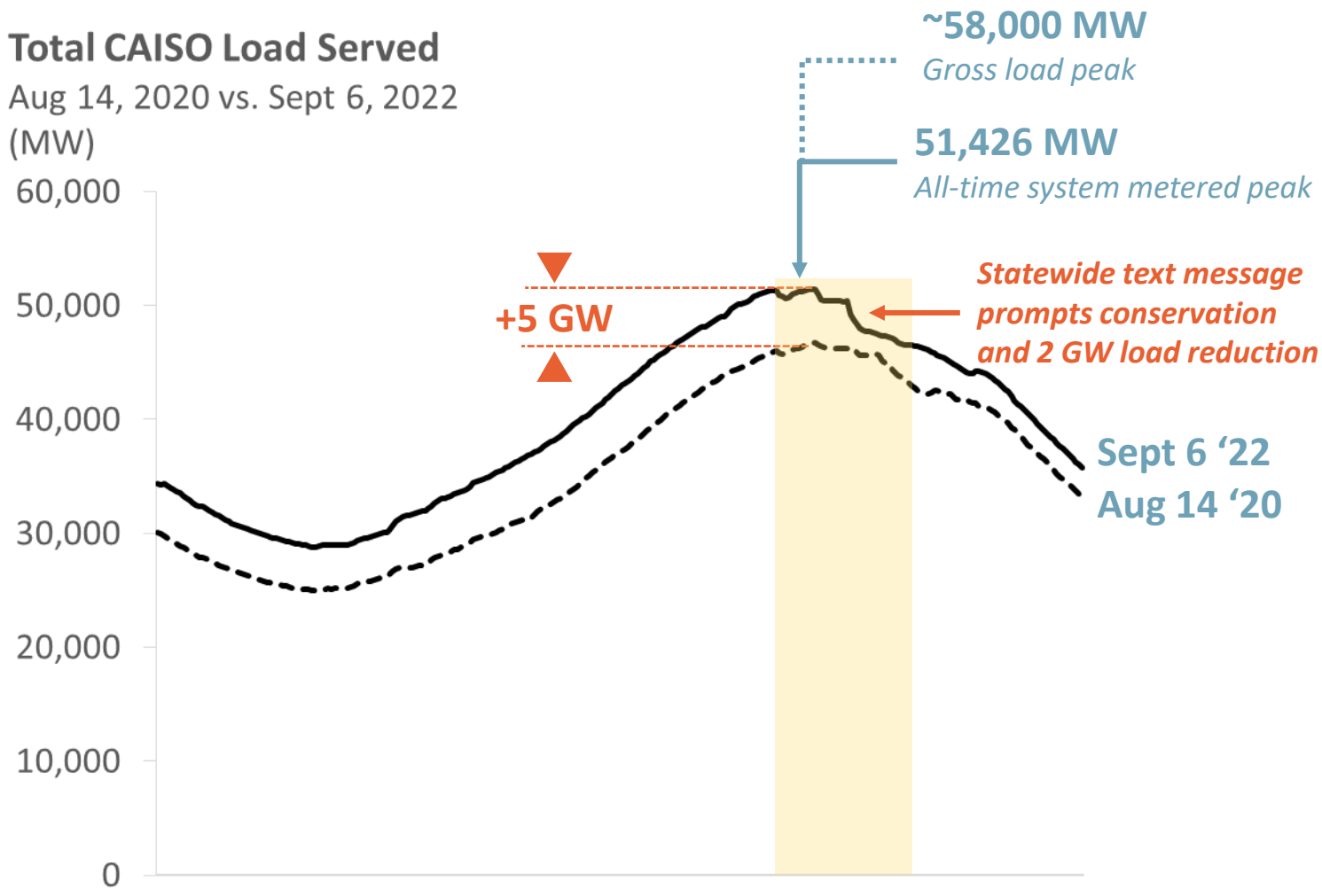
- Many utilities in the West set new summertime ***PEAK DEMAND RECORDS*** during heat dome event on June 29-30, 2021
- Higher summer peaks ***CREATE CHALLENGES*** across generation, transmission and distribution systems
- ***DROUGHT AND WILDFIRES*** create additional challenges with electricity supplies and delivery



September 6, 2022: Extreme Weather, High Loads, and Customer Response

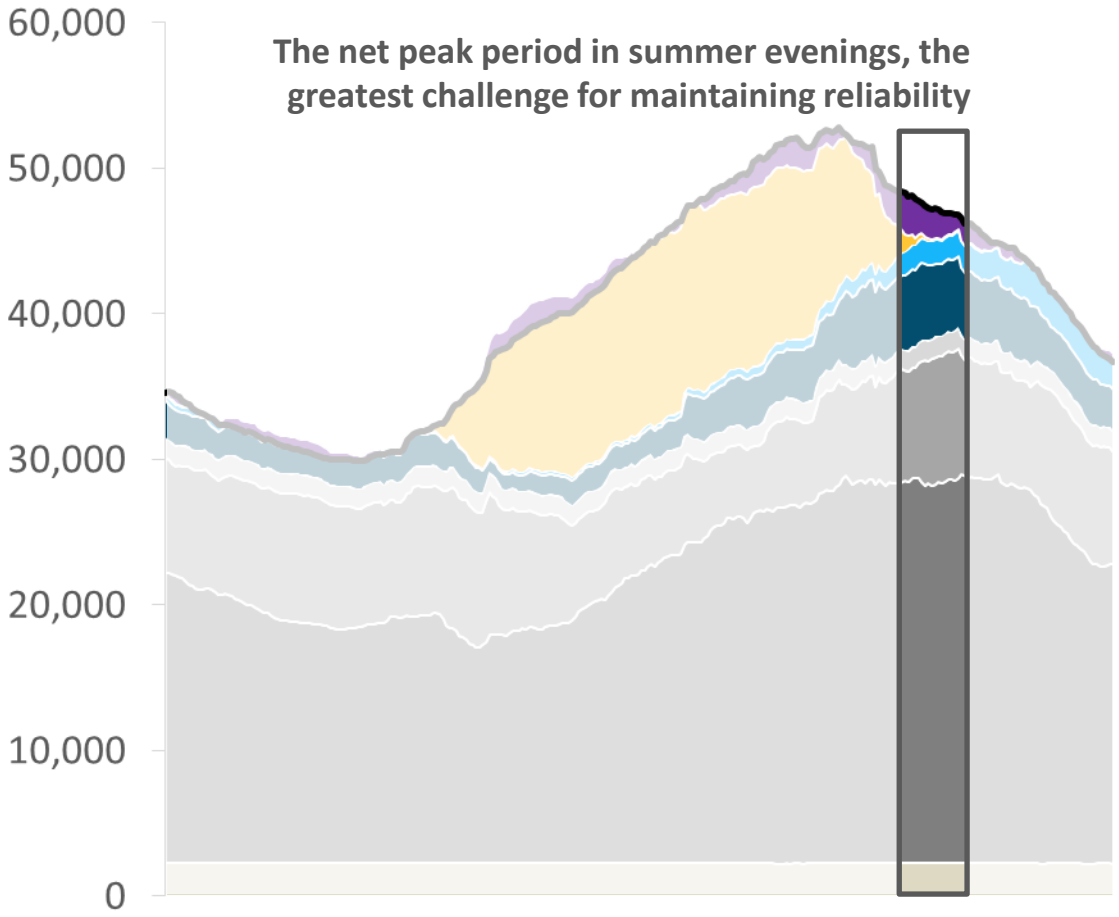
+ **Heat wave in September 2022 drove electricity demand in California to all-time highs**
  - **Significantly higher than loads during August 2020 blackout events**
+ **California's peak demand forecast – even under extreme weather – did not capture magnitude of this event**



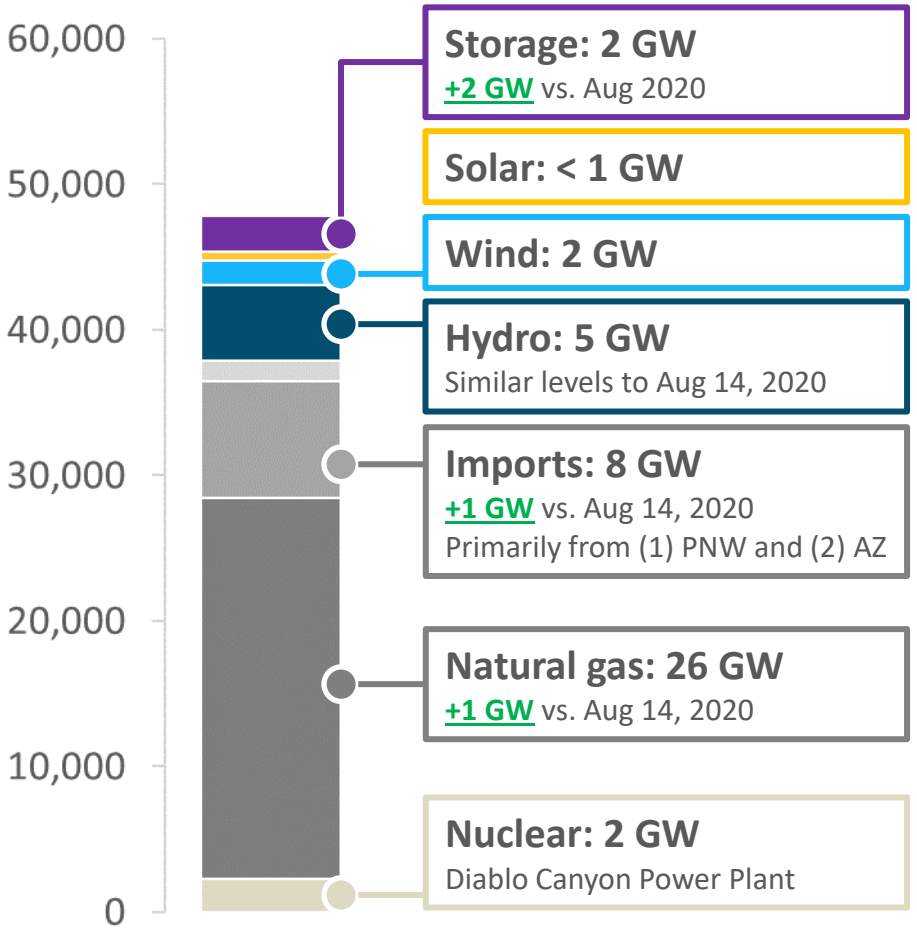


September 6, 2022: Resource Performance During Net Peak

CAISO System Operations on September 6, 2022
(MW)



Generation During Hour of Highest Net Load
(MW)

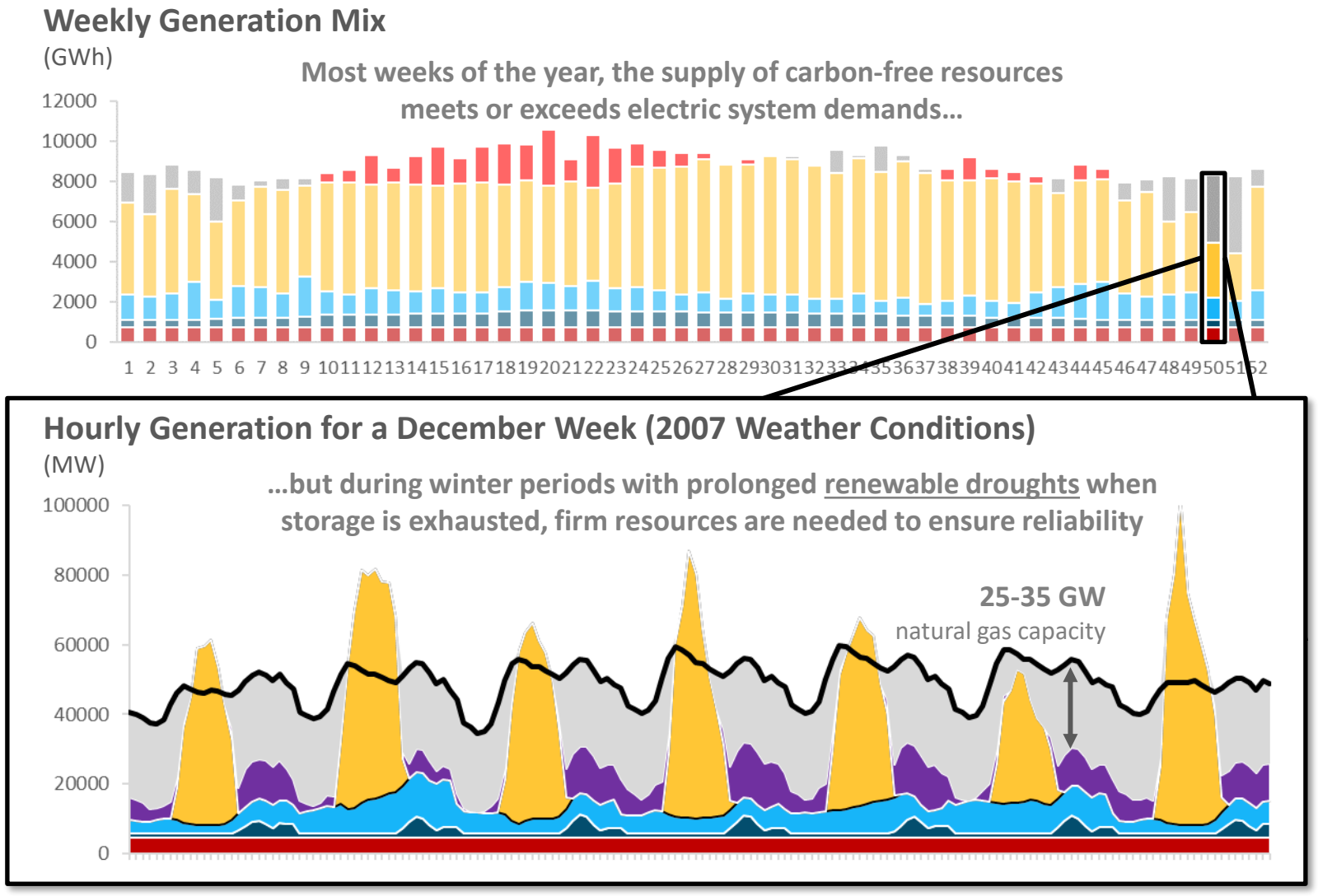


The essential role of firm generation in a low carbon grid: California in 2050

California in 2050 at a glance:

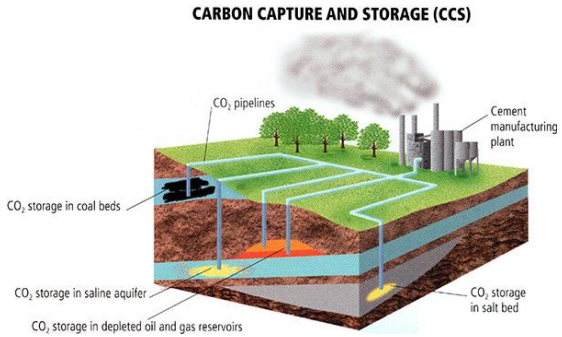
- **93 GW** peak demand
- **90%** carbon-free generation
  - 150 GW solar PV
  - 21 GW wind
  - 8 GW hydro
  - 5 GW geothermal
  - 75 GW energy storage
- **35 GW** reliability need for firm capacity (40% of peak)
- **90% GHG reduction** relative to 2005 levels

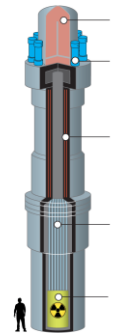
*Statistics and visuals adapted from High Electrification scenario in **Long-Run Resource Adequacy under Deep Decarbonization Pathways for California***

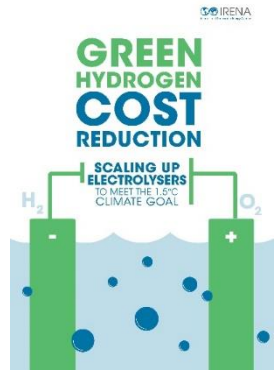


Achieving a fully zero-carbon grid will require new technologies

- ***FIRM, CARBON-FREE RESOURCES*** **will be crucial for reliability if gas resources are retired**
- **Candidates include:**
  - Fossil generation with carbon capture and sequestration
  - New nuclear (e.g., Small Modular Reactors)
  - Enhanced geothermal
  - Very long-duration storage energy storage
  - Clean fuels such as renewable natural gas, hydrogen or synthetic gas
- **These technologies have not yet been proven to be safe, resilient, and cost-effective and are *NOT YET COMMERCIALLY AVAILABLE***
- ***ONE OR MORE MUST EMERGE*** **to enable a reliable, zero-carbon grid**







Thank you!

Arne Olson, Senior Partner (arne@ethree.com)

Energy+Environmental Economics

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BETH
VAUGHAN
Executive Director, CalCCA

CCA Role & Impact

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CALCCA
ADVANCING LOCAL ENERGY CHOICE cal-cca.org

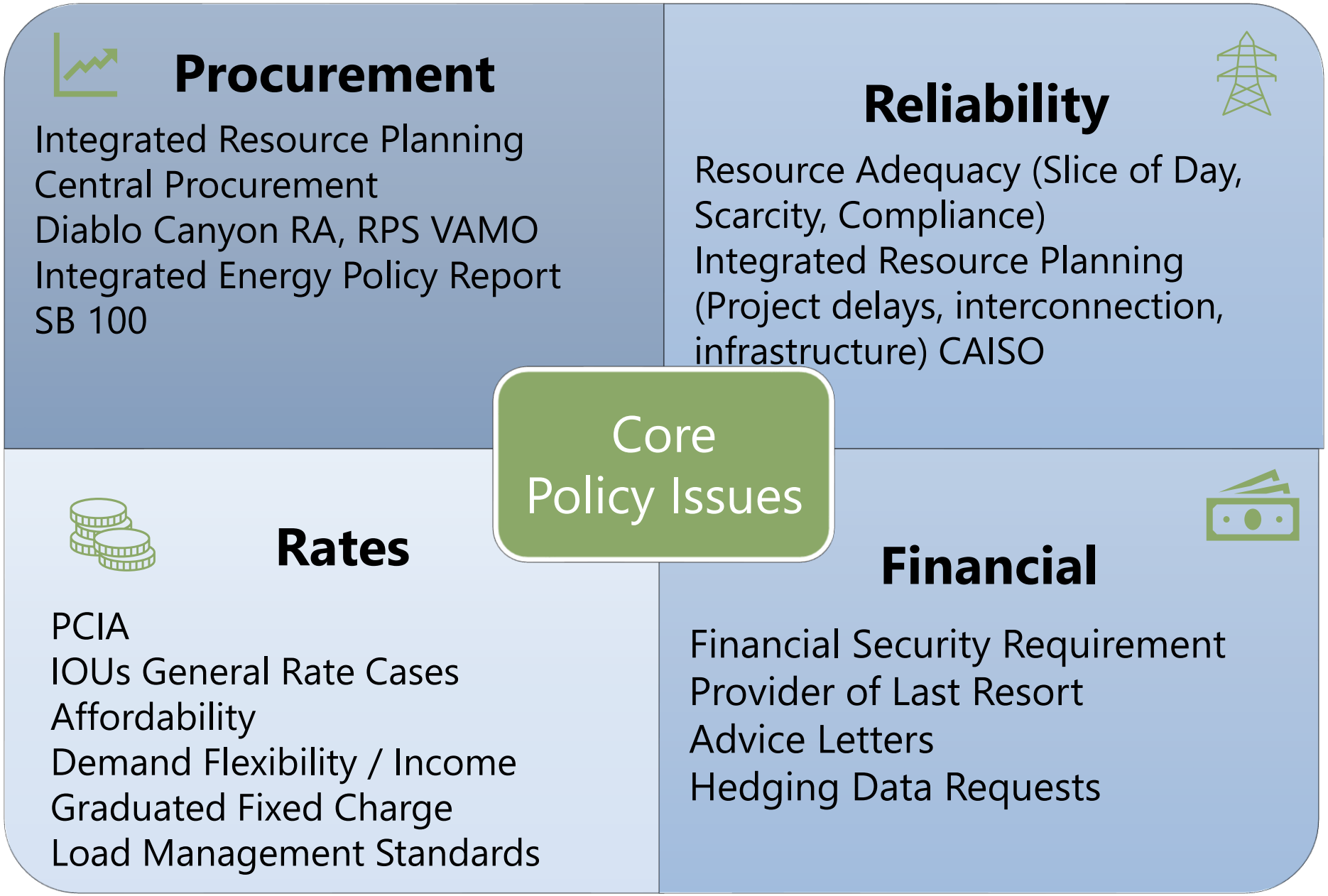
Silicon Valley Clean Energy
Reflect and Recharge
December 13, 2023

Beth Vaughan
CEO, CalCCA

CalCCA Interactive CCA Map & Address Lookup:
https://cal-cca.org/cca-map/

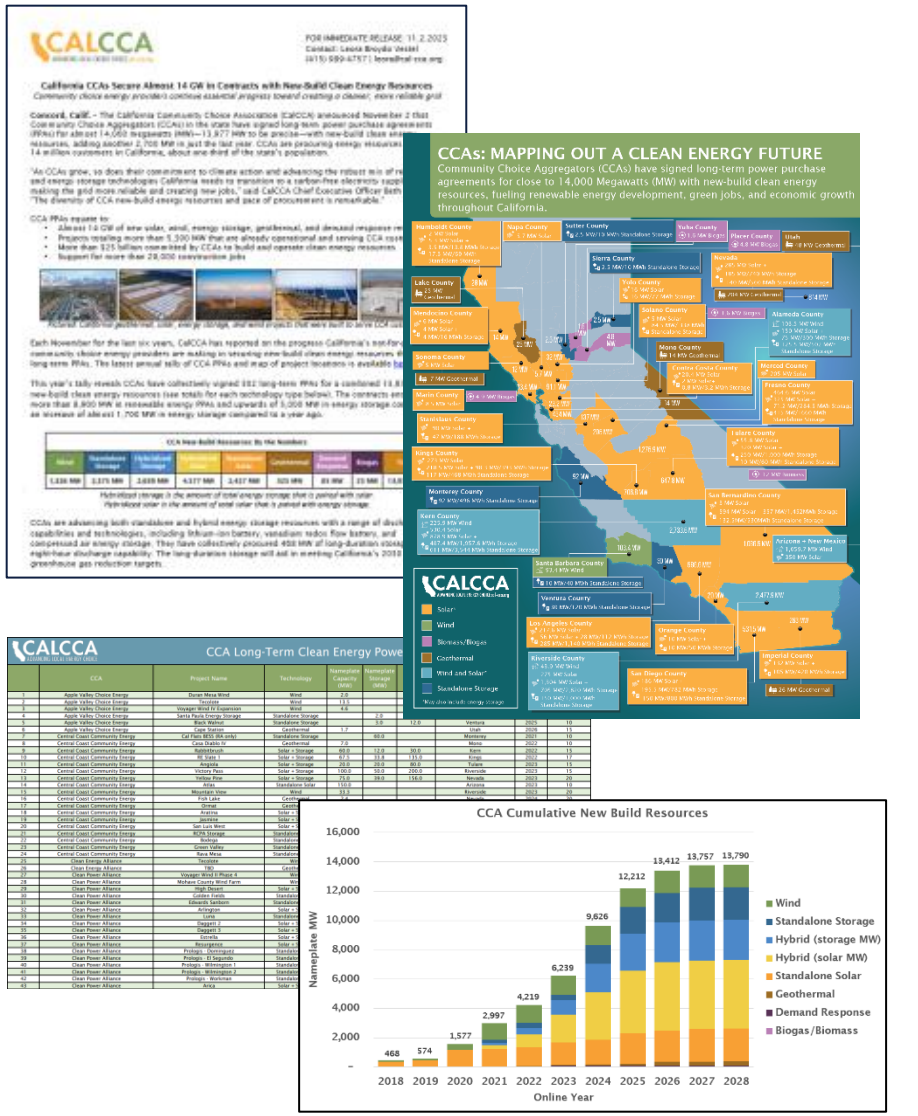
CCA Launch Timeline

- **2010** — MCE
- **2014** — Sonoma Clean Power
- **2015** — Lancaster Choice Energy
- **2016** — CleanPowerSF, Peninsula Clean Energy
- **2017** — Silicon Valley Clean Energy, Apple Valley Choice Energy, Prime, Redwood Coast Energy Authority
- **2018** — Central Coast Community Energy, Pioneer Community Energy, Ava Community Energy, Solana Energy Alliance, San Jose Clean Energy, Rancho Mirage Energy Authority, CPA Clean Power Alliance, San Jacinto Power, Valley Clean Energy, King City Community Power
- **2020** — Desert Community Energy, Pomona Choice Energy
- **2021** — San Diego Community Power, Redding Clean Energy, Clean Energy Alliance
- **2022** — Orange County Power Authority, Epic


Procurement
Integrated Resource Planning
Central Procurement
Diablo Canyon RA, RPS VAMO
Integrated Energy Policy Report
SB 100
Reliability
Resource Adequacy (Slice of Day, Scarcity, Compliance)
Integrated Resource Planning (Project delays, interconnection, infrastructure) CAISO
Core Policy Issues
Rates
PCIA
IOUs General Rate Cases
Affordability
Demand Flexibility / Income Graduated Fixed Charge
Load Management Standards
Financial
Financial Security Requirement
Provider of Last Resort
Advice Letters
Hedging Data Requests

CCA LONG-TERM PPA STATS

(Annual announcement: November 2, 2023)



CCA PPAs equate to:

- Almost 14 GW of renewables + energy storage
- More than 5,300 MW operational
- More than $25 billion committed by CCAs to build/operate
- Support for 29,000 construction jobs

https://cal-cca.org/cca-renewable-energy-map-and-list-of-ppas/

Progress Toward State Goals

LLT Procurement by LSE Type

LSE Type	D.21 2028 LDES			D.21 2028 FIRM ZE			LLT Total		
	Obligation	Claimed	Excess / Shortfall	Obligation	Claimed	Excess/ Shortfall	Obligation	Claimed	Excess/ Shortfall
CCA	310	282	-28	310	358	48	621	641	20
ESP	97	0	-97	97	0	-97	193	0	-193
IOU	594	0	-594	594	0	-594	1,188	0	-1,188
Grand Total	1,000	282	-719	1,000	358	-642	2,000	641	-1,361

- Collectively the LSEs reported to **under procure** for both LLT resource categories.
  - CCAs are the only LSEs to have reported procurement.
  - IOUs and ESPs have not reported procurement towards LLT.

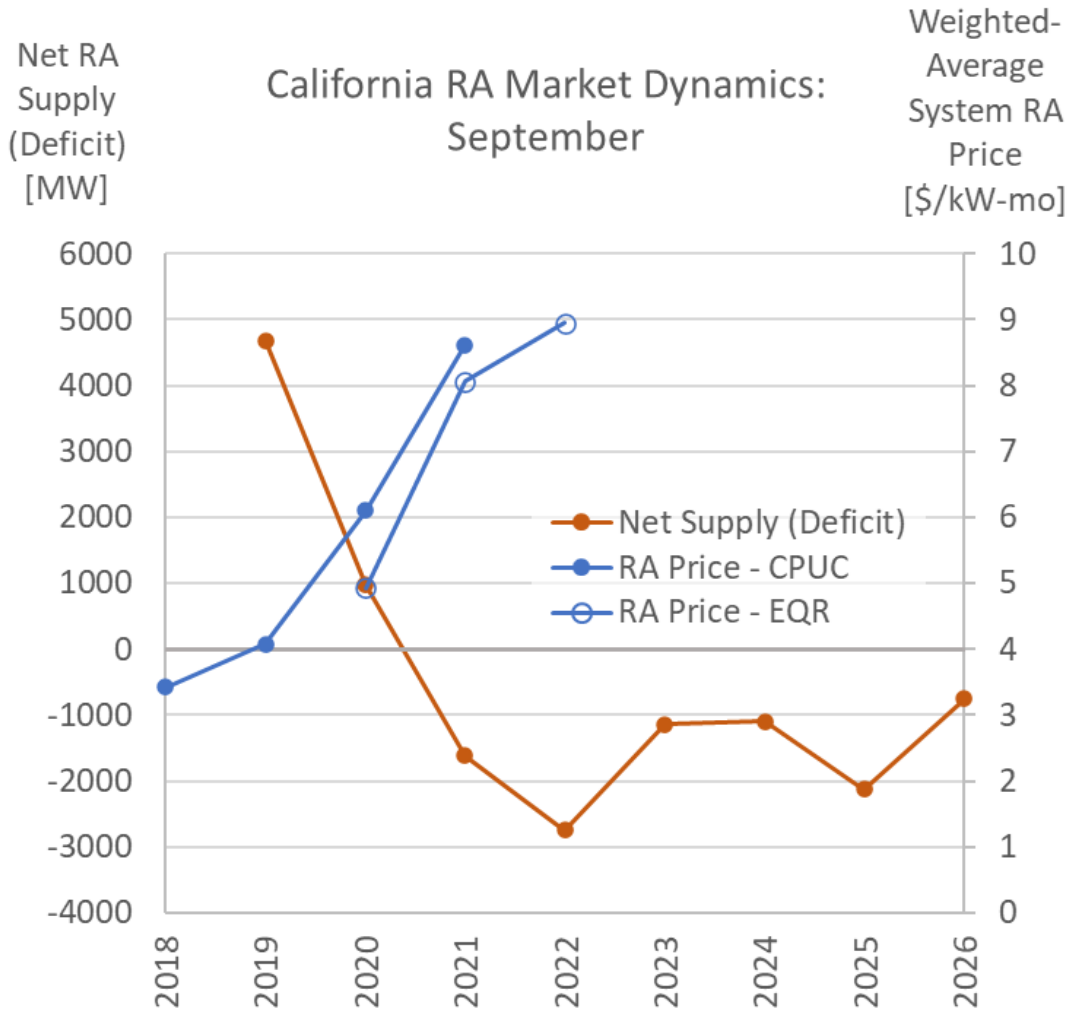
California Public Utilities Commission 53

Data Sources: CPUC MTR Progress Report, November 6, 2023

Tight RA Market = High RA Prices

A 6 GW drop in net RA supply over 2019-21 accompanied by doubling of the average RA price

White Paper: California's Constrained RA Market: Ratepayers Left Standing in a Game of Musical Chairs *https://cal-cca.org/resource-adequacy*



Data Sources: CalCCA RA Stack, CPUC Resource Adequacy Reports, FERC EQRs

Save the Date!

Thank you!

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