Current State of the California Market

Sacramento Municipal Utility District

Board of Directors Meeting

May 14, 2025

Sacramento, California

Energy+Environmental Economics

Arne Olson, Senior Partner

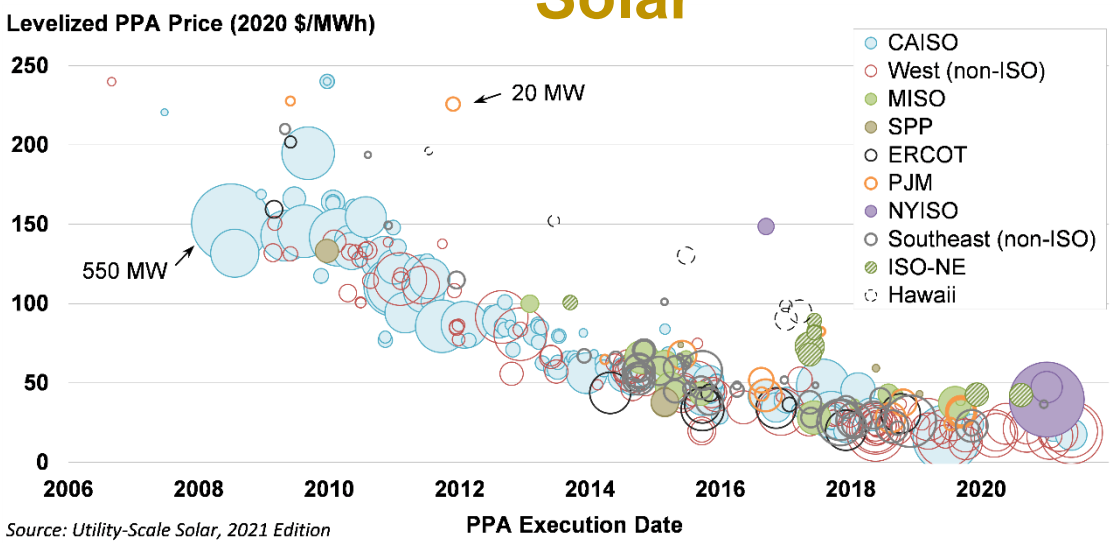
Agenda

1. California market: where are we now
2. Looking ahead: uncertainty is the only thing that's certain
3. Final thoughts

The past ten years has been a period of relative calm in electricity markets

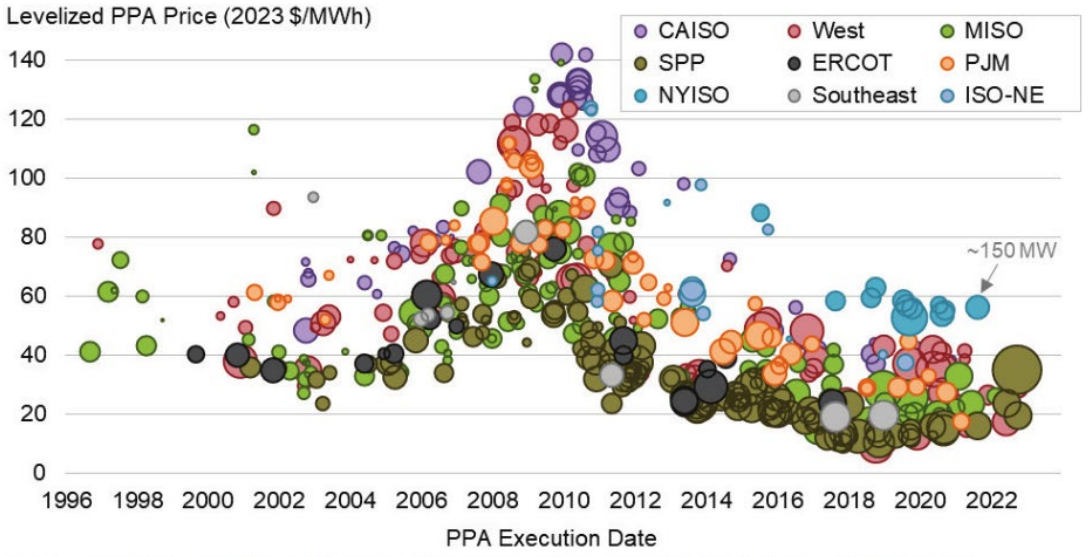
The last ten years have been an era of declining resource costs

Solar



Source: Utility-Scale Solar, 2021 Edition

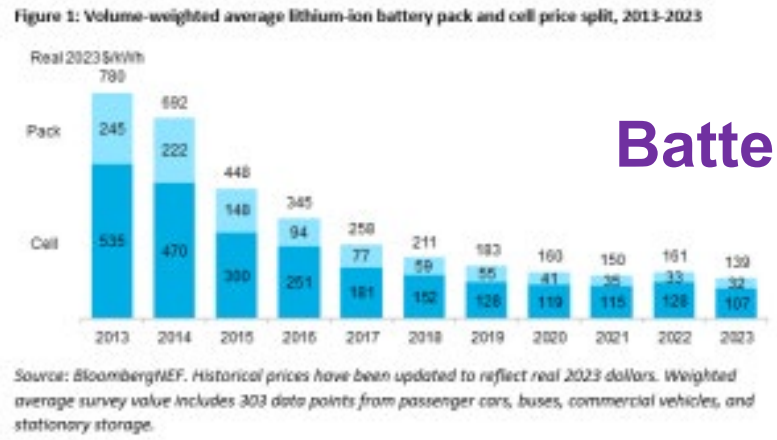
Wind



Note: Smallest bubble sizes reflect smallest-volume PPAs (<5 MW), whereas largest reflect largest-volume PPAs (>500 MW)

Source: Berkeley Lab, FERC

Batteries

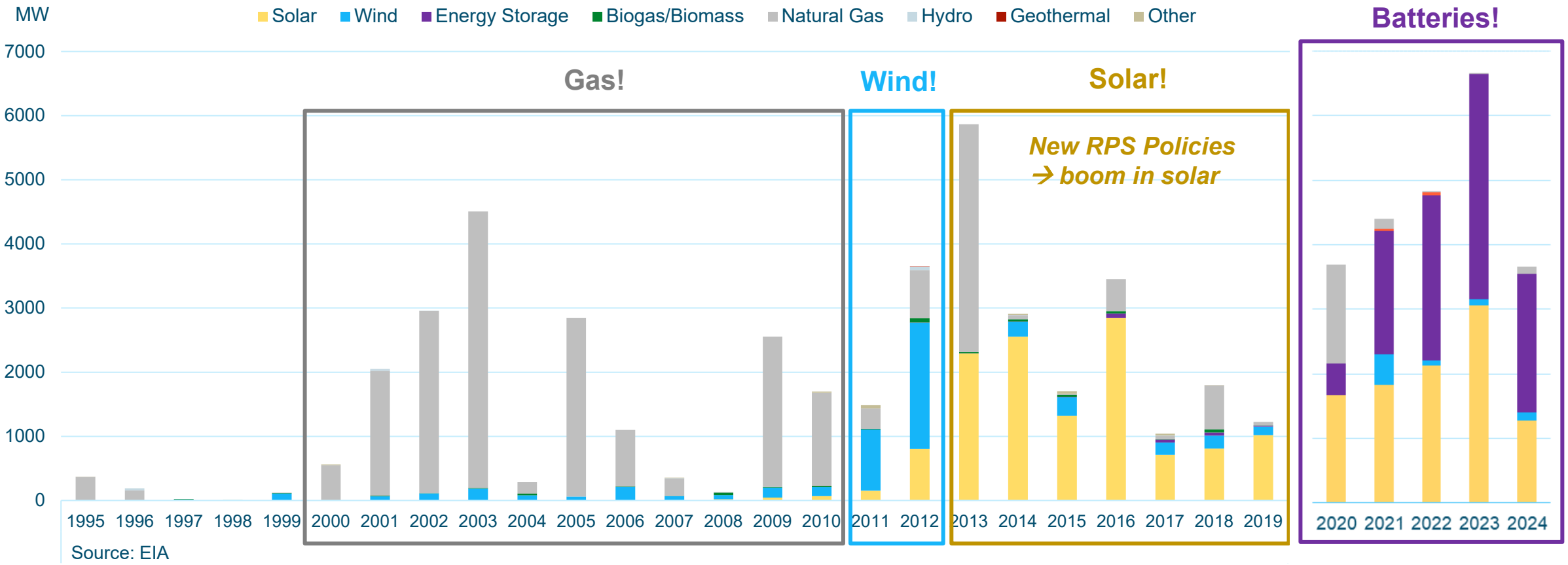


Source: BloombergNEF. Historical prices have been updated to reflect real 2023 dollars. Weighted average survey value includes 303 data points from passenger cars, buses, commercial vehicles, and stationary storage.

Key drivers included:

- + Technology "learning" and maturation
- + Low interest rates
- + Supportive federal tax and trade policy

CA's Evolving Grid: Resource Additions 1995-2024



CA energy crisis
→ boom in gas generation
→ RA surplus + birth of RA program

New RPS Policies
→ boom in solar PV

RA Procurement Orders
→ boom in batteries

CPUC reliability orders since 2019 have kept or added 21 GW of incremental capacity

+ 2019: Delay retirement of 3.8 GW of gas plants PLUS 2.5 GW of new procurement by 2023

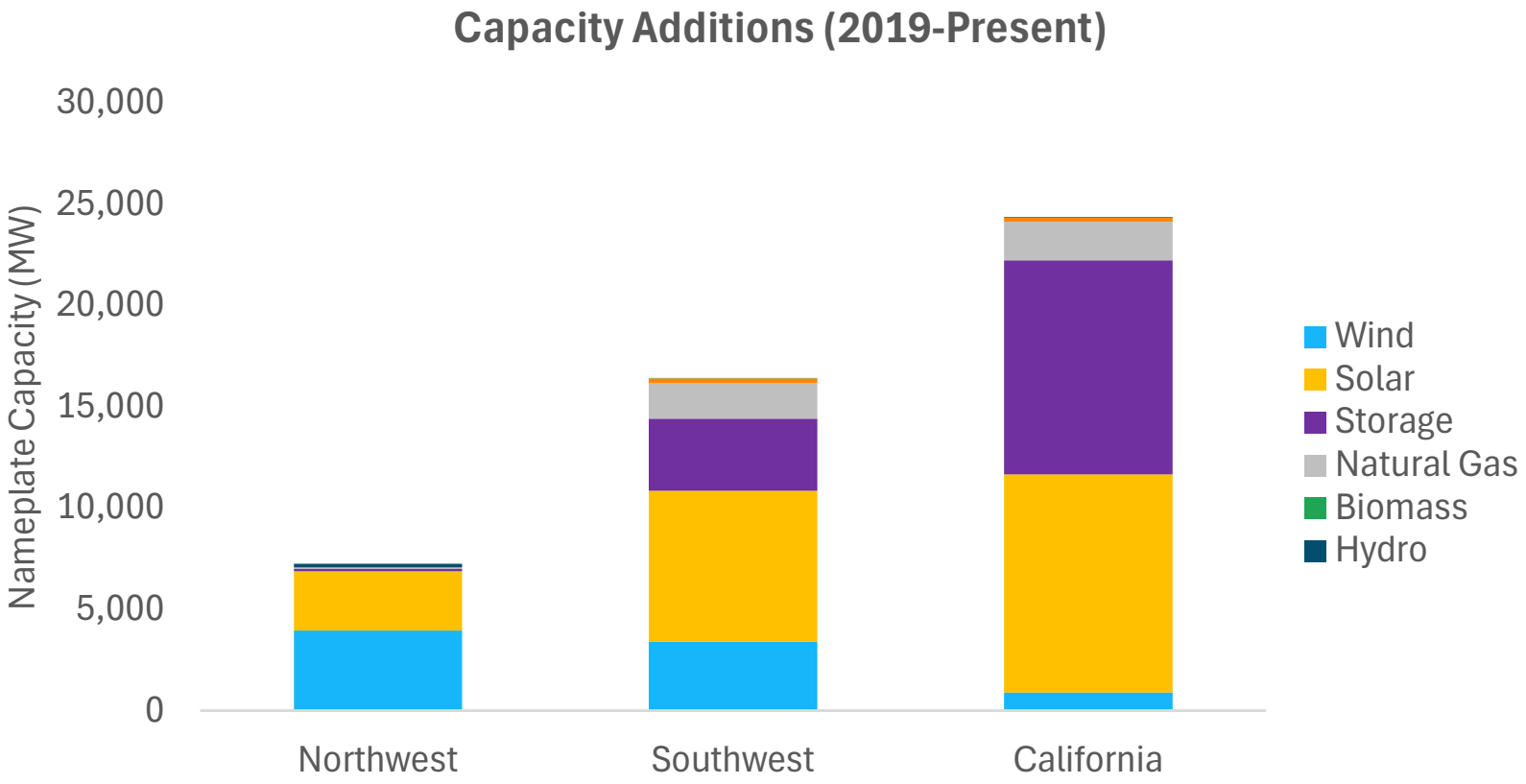
+ Mid-term Reliability (MTR) Orders: 2021, 11.5 GW of "effective capacity" by 2028, +4 GW ordered in 2023

+ Has led to development of over 13 GW of battery storage and no energy alerts during 2024!

Need Type	2023	2024	2025	2026	2027	2028
General D.21-06-035 requirements[7]	2,000	6,000	1,500			
LLT resources, as defined in D.21-06-035						2,000
New in this decision				2,000	2,000	
Total	**2,000**	**6,000**	**1,500**	**2,000**	**2,000**	**2,000**
Total (cumulative)	**2,000**	**8,000**	**9,500**	**11,500**	**13,500**	**15,500**

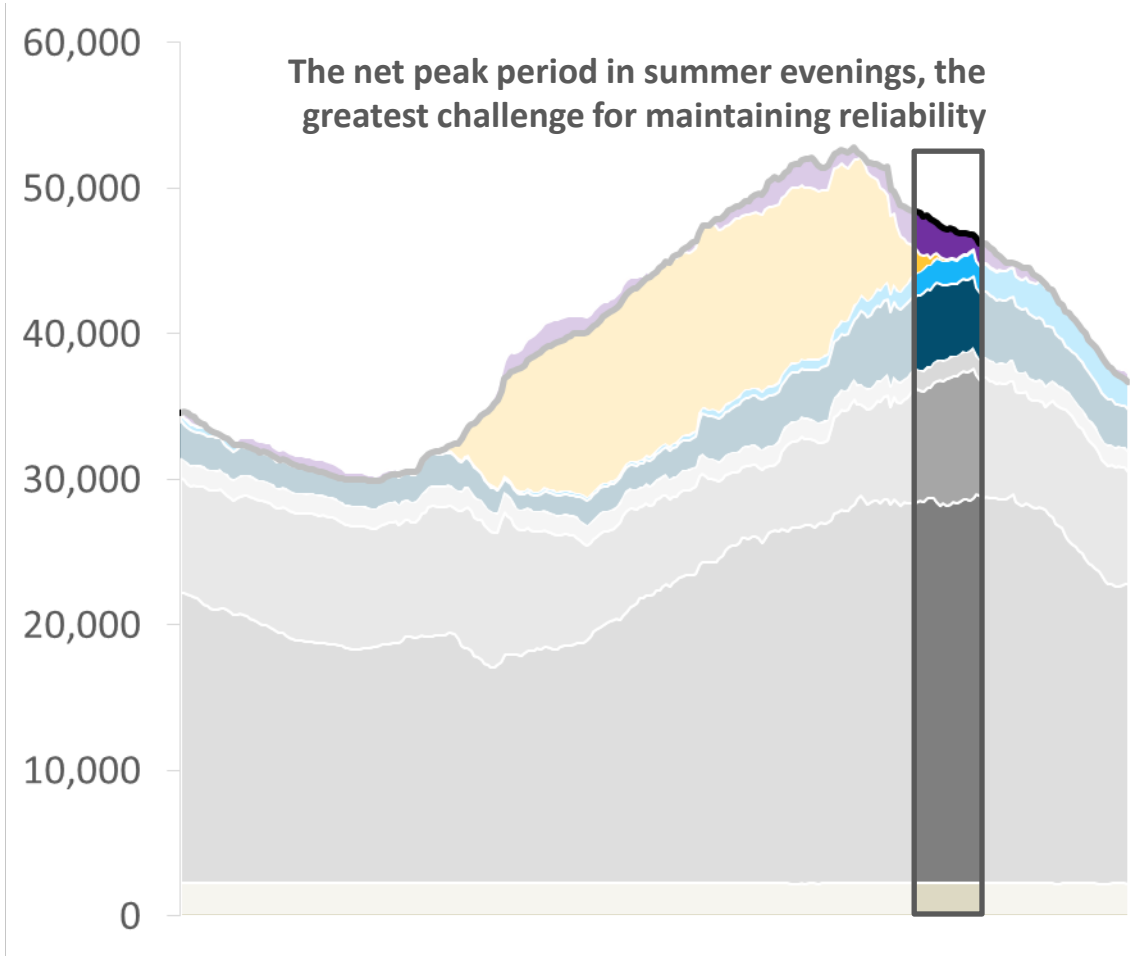
California is building much faster than the rest of the Western Interconnection

- **Capacity additions since 2019, by ELCC (approximate):**
  - Northwest: 900 MW
  - Southwest: 3,500 MW
  - California: 12,800 MW
- **California load is roughly equivalent to PNW + DSW**
- **Resource additions in the Pacific Northwest have not kept pace with growth**

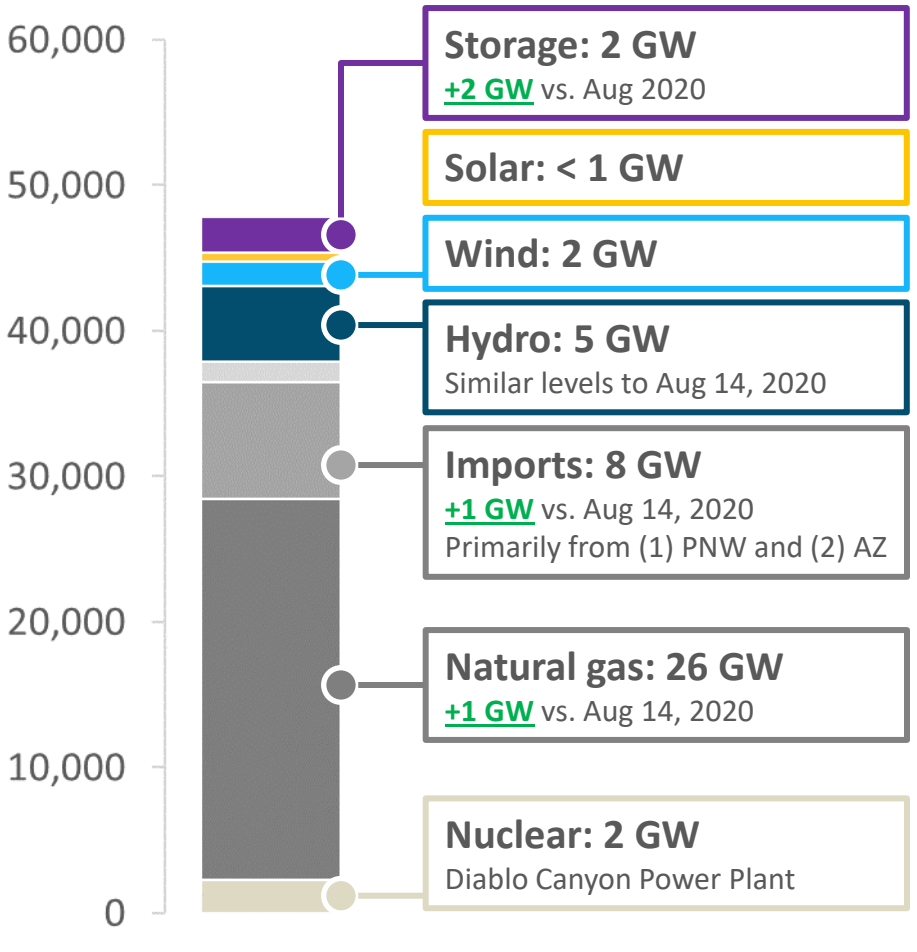


September 6, 2022: Historic Peak—A Very Close Call!

CAISO System Operations on September 6, 2022
(MW)

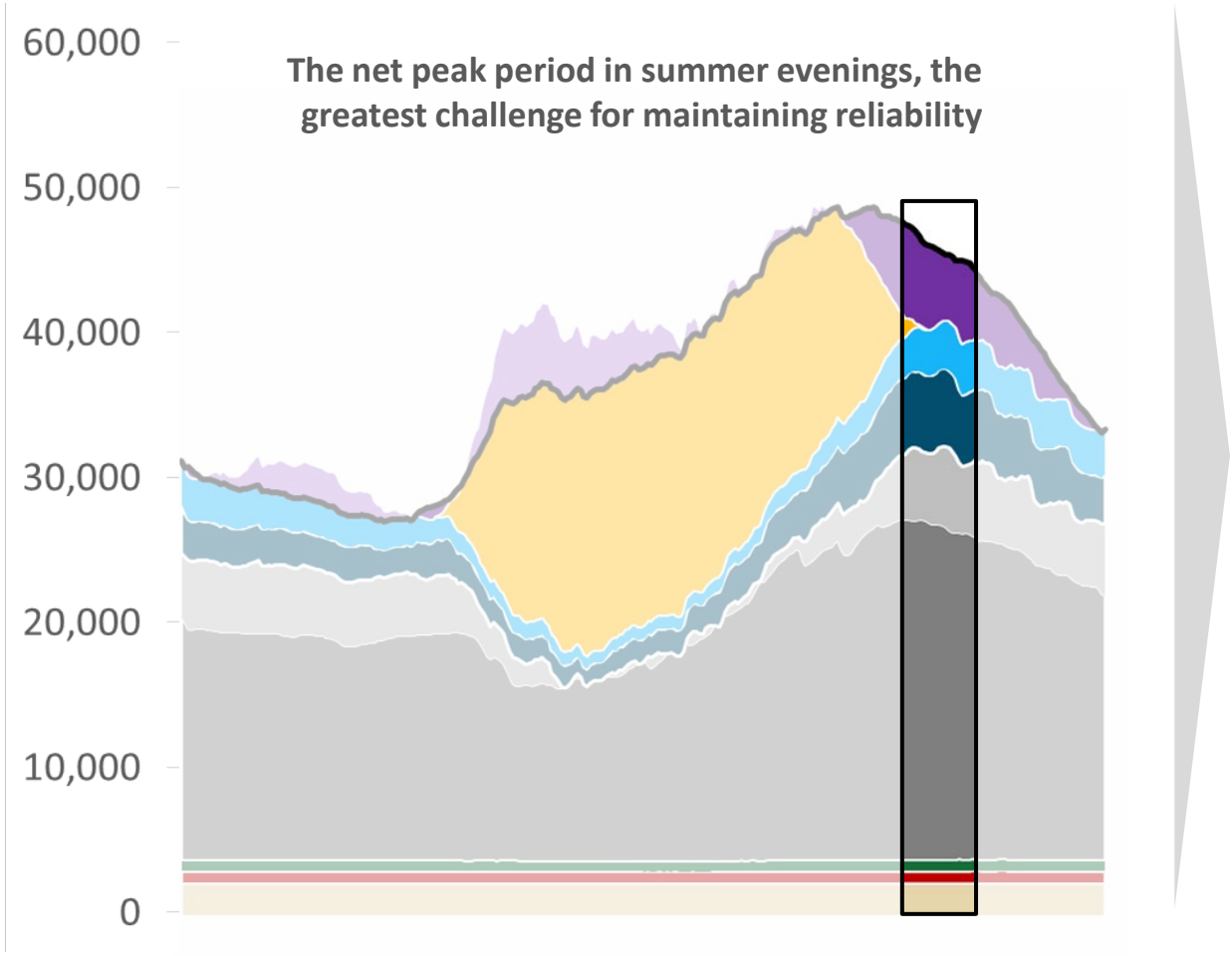


Generation During Hour of Highest Net Load
(MW)



September 5, 2024: System is in Better Shape Now…

CAISO System Operations on September 5, 2024
(MW)



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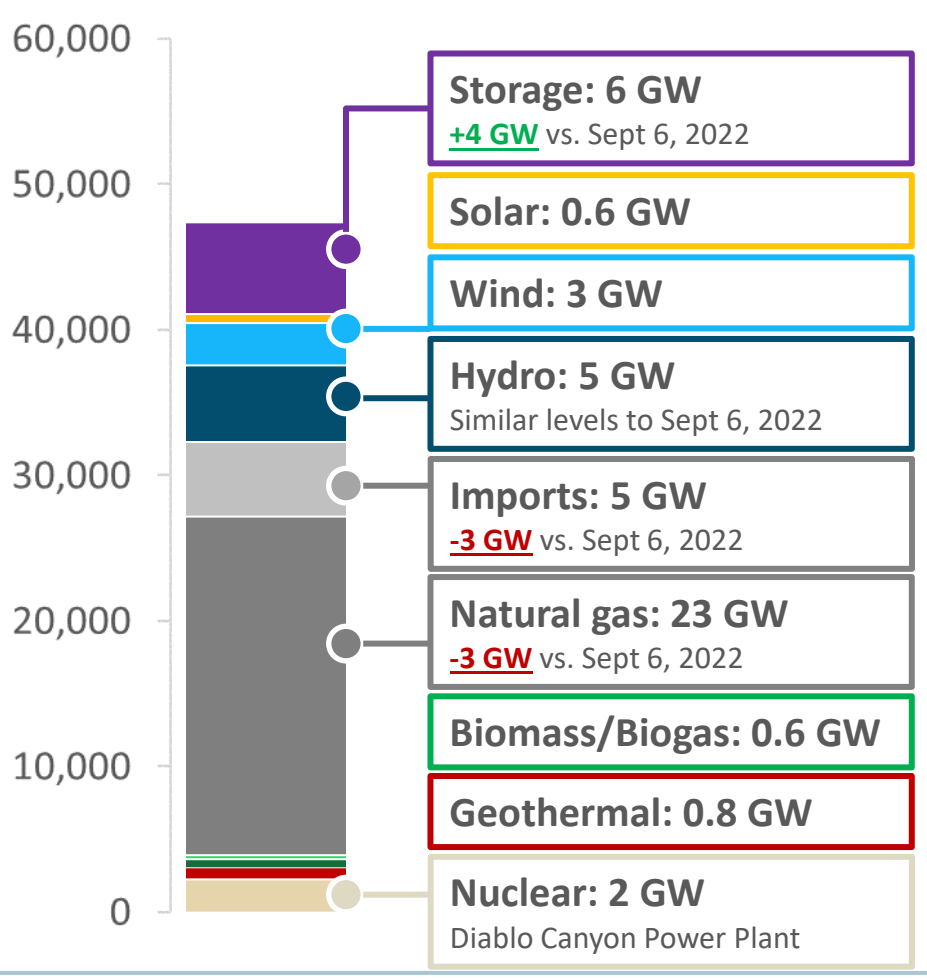
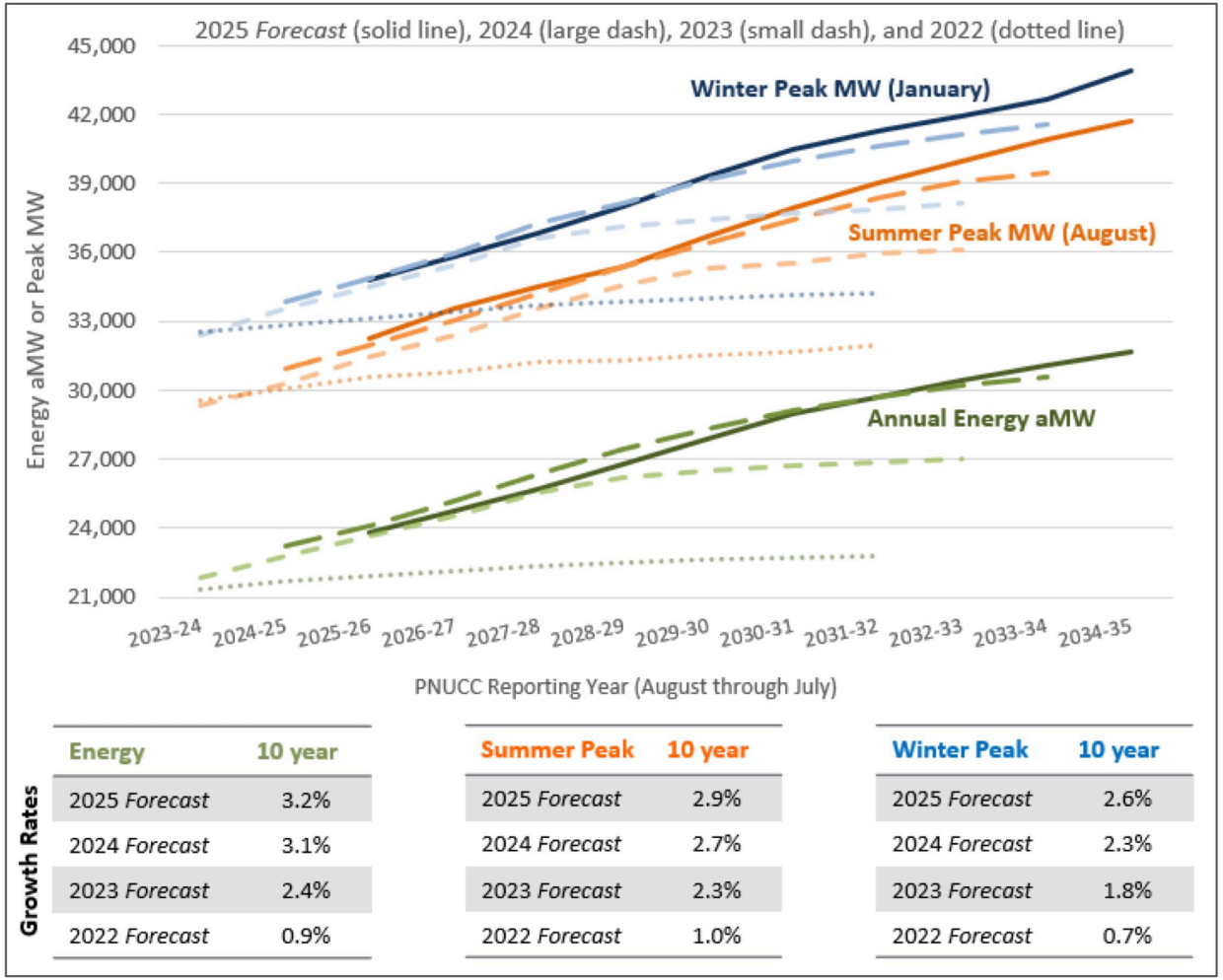


Future of electricity markets in California and the West is a little more … stormy!

Latest load forecasts in the Northwest are significantly higher, especially in summer

PNUCC 2025 Northwest Regional Forecast

Energy aMW or Peak MW Forecast



Growth Rates

Energy	10 year
2025 *Forecast*	3.2%
2024 *Forecast*	3.1%
2023 *Forecast*	2.4%
2022 *Forecast*	0.9%

Summer Peak	10 year
2025 *Forecast*	2.9%
2024 *Forecast*	2.7%
2023 *Forecast*	2.3%
2022 *Forecast*	1.0%

Winter Peak	10 year
2025 *Forecast*	2.6%
2024 *Forecast*	2.3%
2023 *Forecast*	1.8%
2022 *Forecast*	0.7%

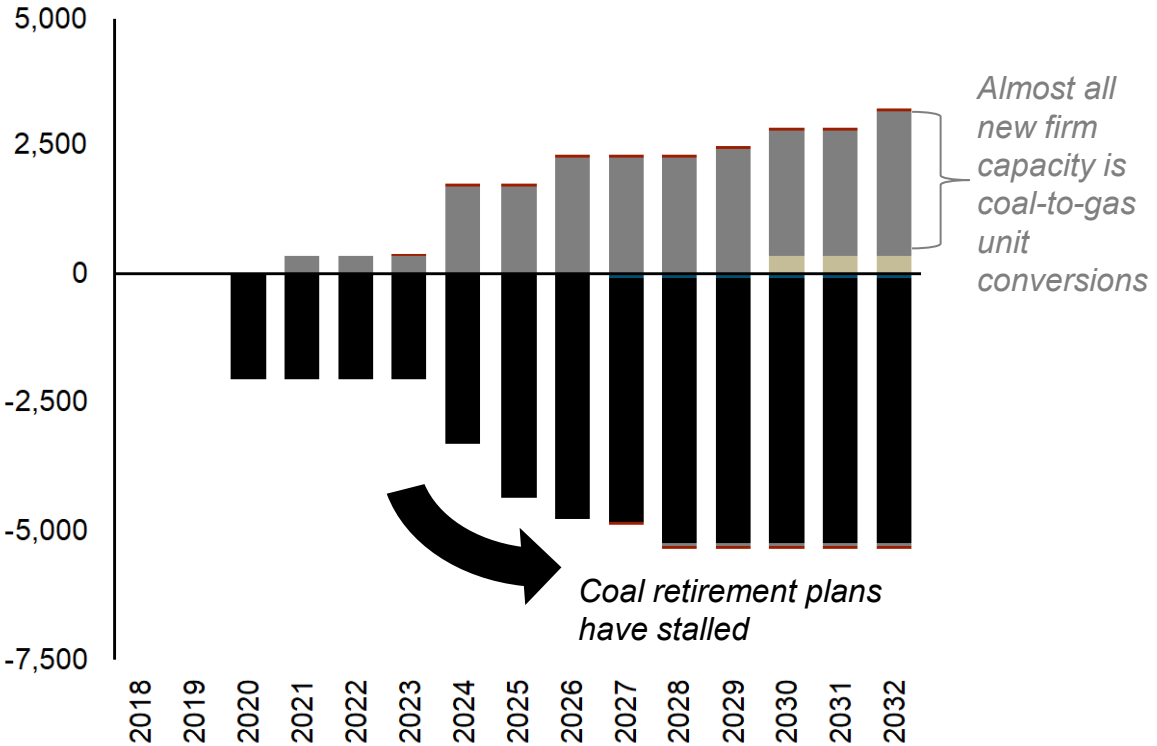
Driver	Near-term Impact
Economywide **energy efficiency**	Small load reductions in both seasons
Higher-than-expected **air conditioning adoption** after recent heat waves	Small-medium peak load growth in the summer
Policy-driven **electric vehicle adoption**	Medium peak load growth in both seasons
Population growth and new building construction	Medium peak load growth in both seasons
Anticipated **data center** interconnection	Large average and peak load growth in both seasons

Northwest resource trends show a net decline in firm capacity with higher renewables

Fossil Retirement and Conversion

Cumulative Changes (Nameplate MW)[1]

Greater NW

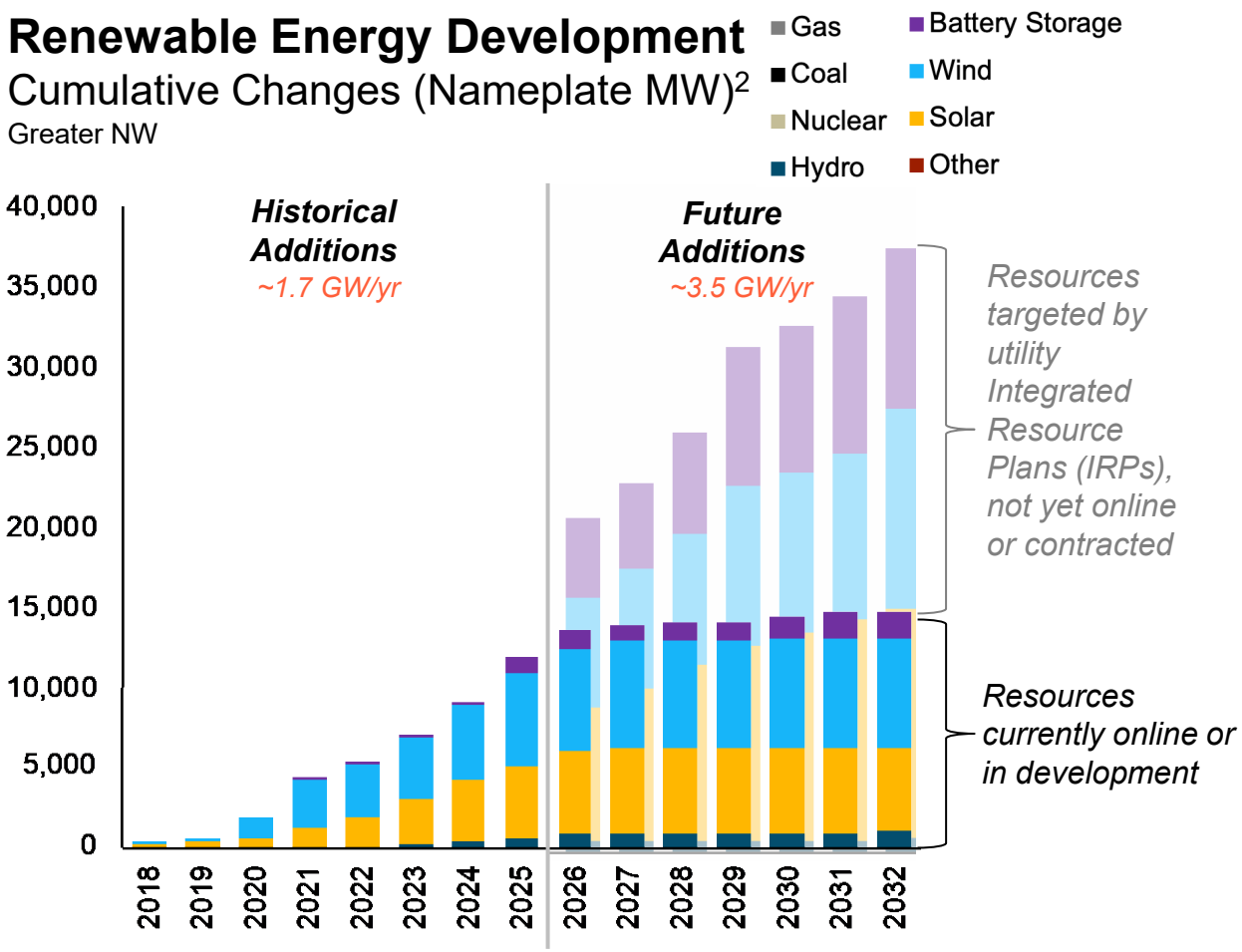


Firm coal retirements continue to outpace new firm capacity additions

Renewable Energy Development

Cumulative Changes (Nameplate MW)[2]

Greater NW



Reaching the nearly 35,000 MW of new renewable energy and storage in utility IRPs will require doubling the rate of recent additions

1. Based on WECC 2034 ADS and latest IRPs published as of April 2025; reflects PacifiCorp's coal retirement dates announced by the end of 2024
2. IRP-targeted resources include WECC ADS 2034 generic resources which are part of IRP plans; In-development resources are WECC ADS 2034 facilities with confirmed project location, project name, and can be verified online

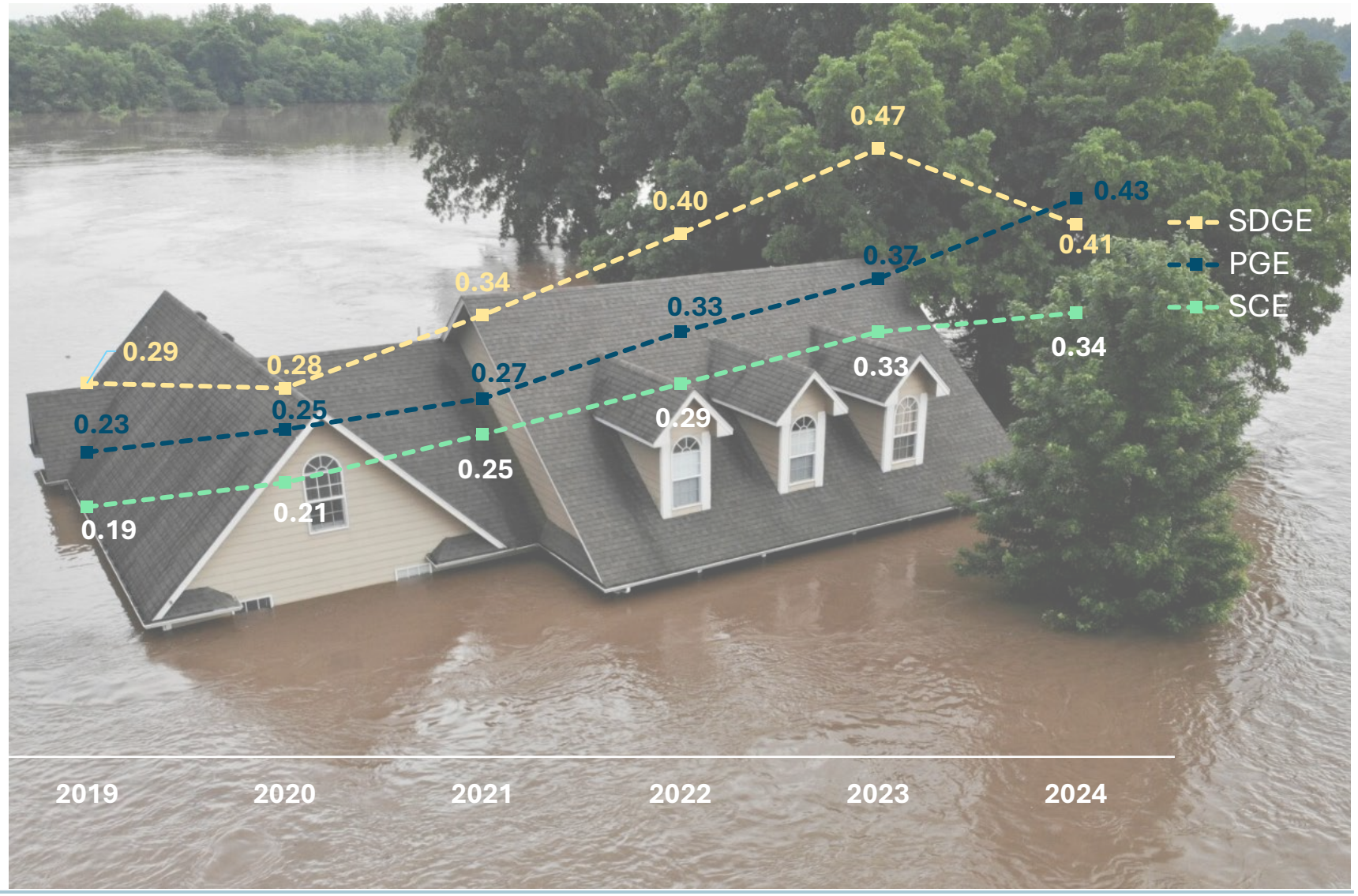
Customers of California IOUs are facing an Affordability crisis

Since 2019, residential rates have increased significantly:

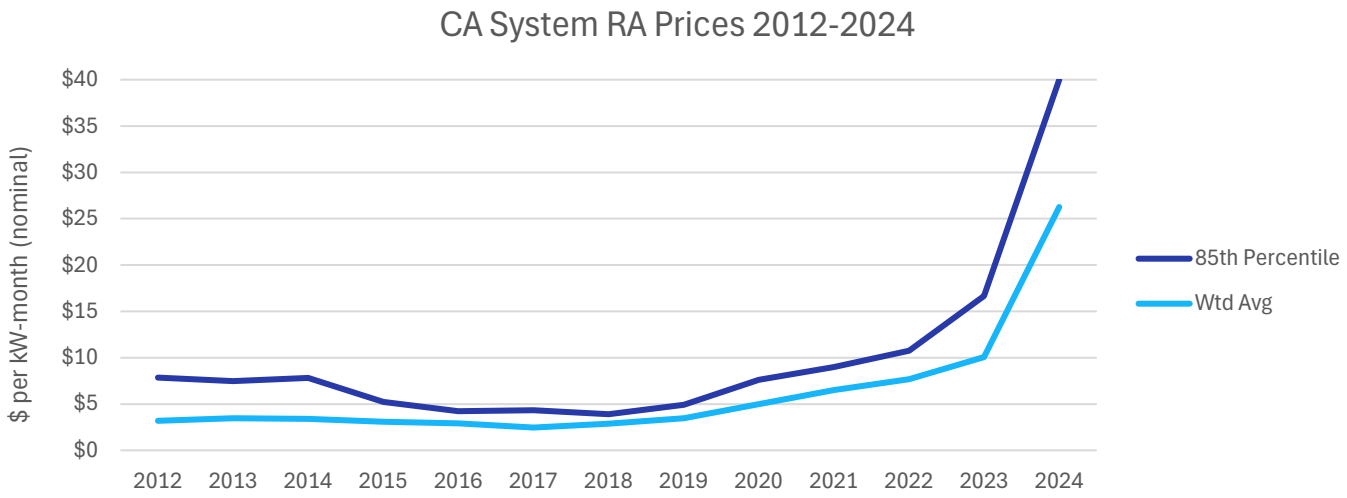
+ PG&E: +87% (~11%/yr)
+ SCE: + 79% (~10%/yr)
+ SDG&E: + 41% (~6%/yr)

Customers are being flooded with higher costs…

+ Wildfire mitigation and damages
+ Cost of capital and other inflationary pressures
+ Net energy metering cost-shift



Capacity market prices are peaking under stress



+ CA RA prices have risen dramatically since 2022
+ Slice-of-Day is creating artificial scarcity

DIVE BRIEF

PJM capacity prices hit record highs, sending build signal to generators

Consumers across the PJM Interconnection footprint will pay $14.7 billion for capacity in the 2025-26 delivery year, up from $2.2 billion in the last auction.

Published July 31, 2024

DIVE BRIEF

MISO capacity prices triple for next summer, spring, partly on power plant retirements

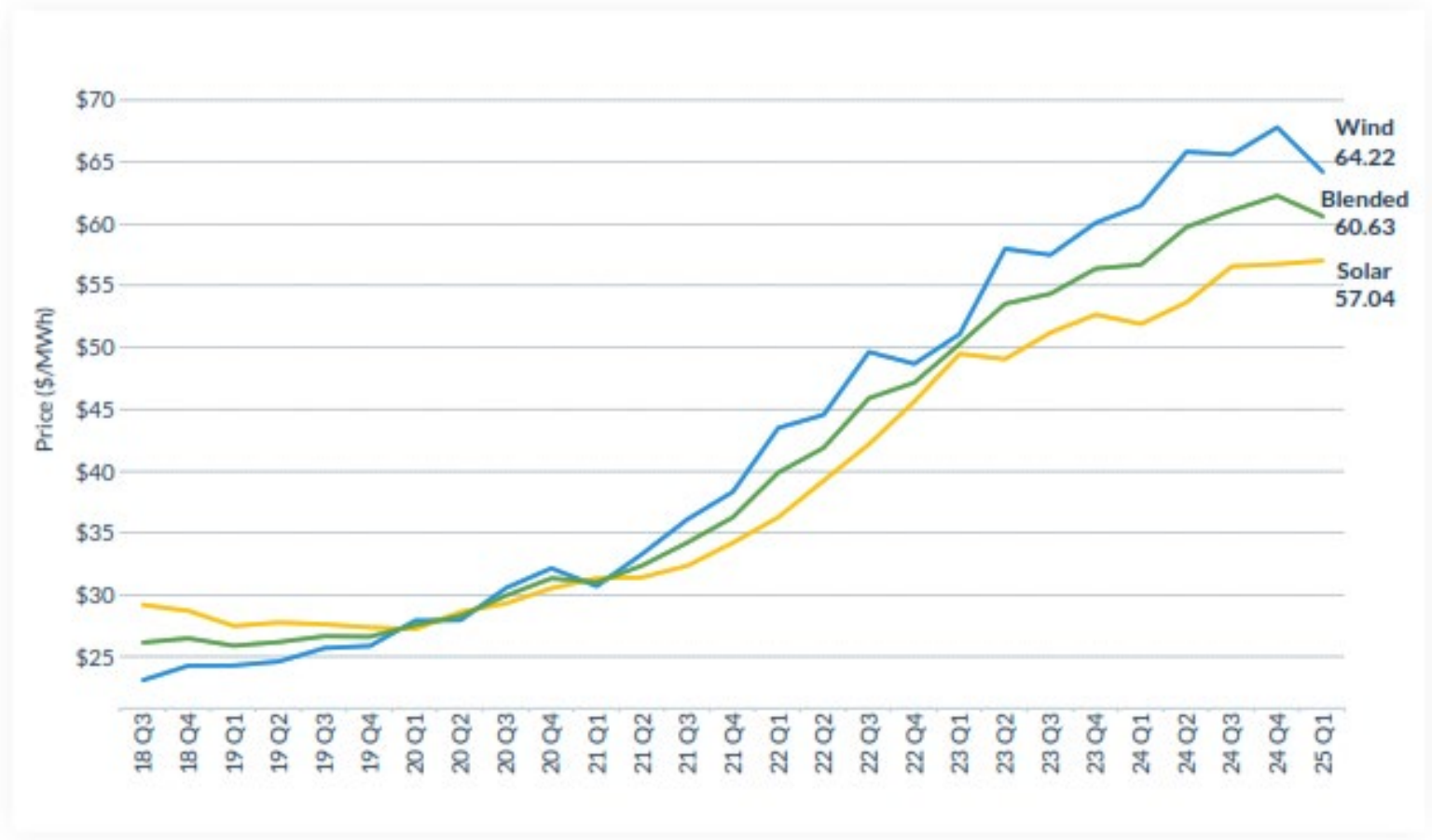
Prices for Ameren Missouri and Columbia, Missouri's municipal utility jumped to nearly $720/MW-day for the upcoming fall and spring seasons due to expected power supply shortages.

Published April 26, 2024

Costs are sky-high right now for all new resources

- **Solar and wind PPAs are now $50-60/MWh**
  - More than double pre-pandemic levels
- **Price pressures will continue due to:**
  - Competition from tech industry
  - Land, labor, equipment, interconnection, tariffs
- **Gas CT costs at or above $2000/kW**

Solar and Wind PPA Price Index: North America (LevelTen)

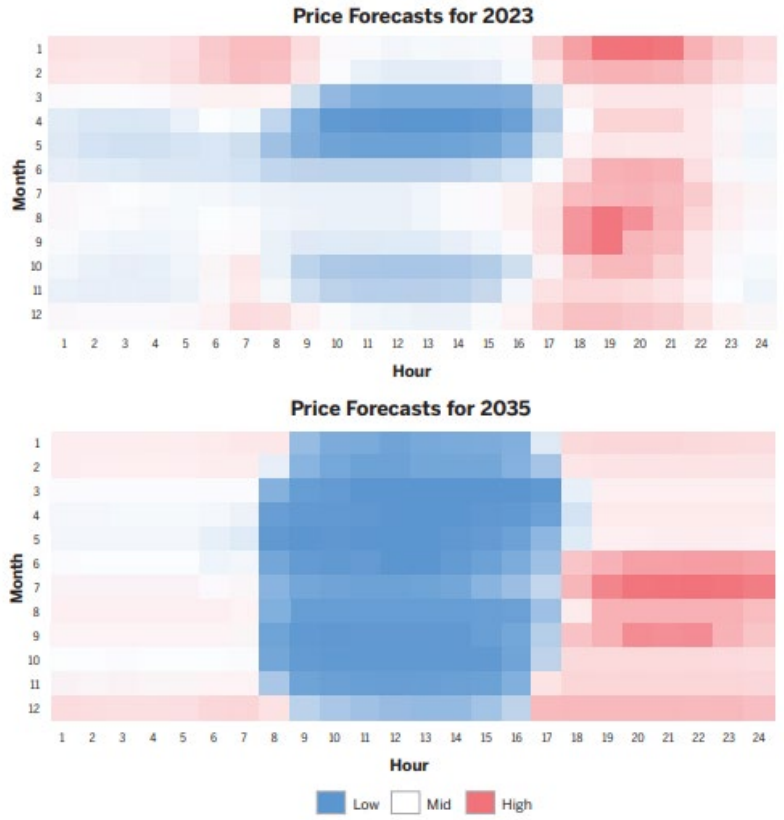


Source: LevelTen Energy (www.leveltenenergy.com/ppa)

The California market will be trickier to navigate in the future due to solar saturation

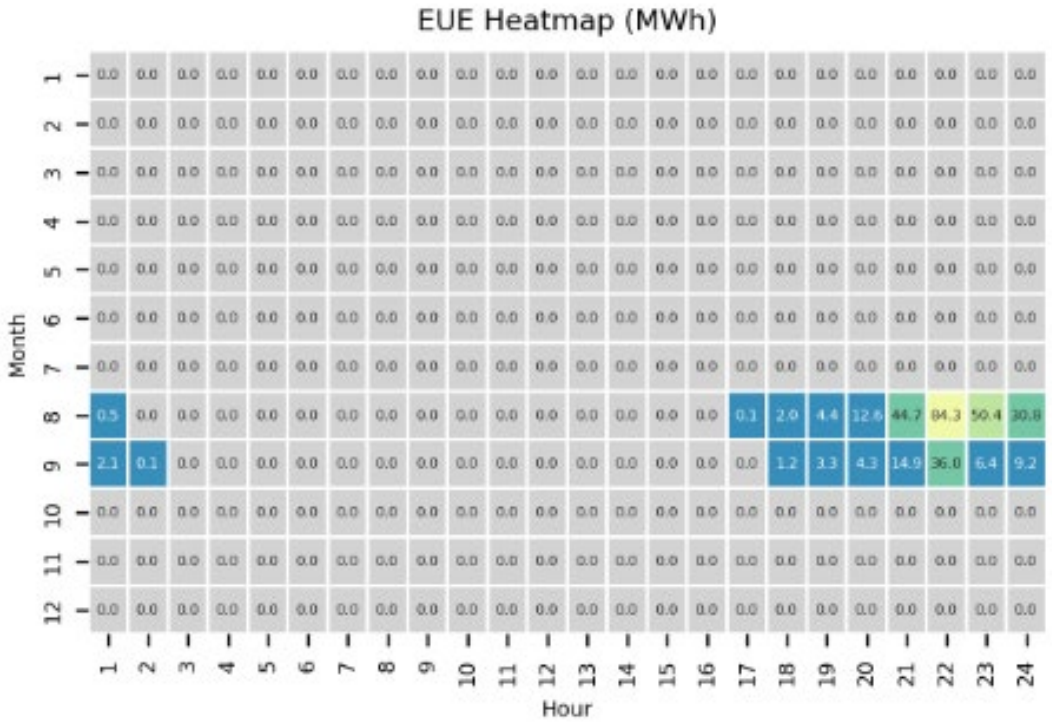
- There were over 1000 hours of curtailment and negative prices in Southern California in 2024
- Generators are paying up to -$67/MWh at for buyers to take their power
- Curtailment and negative pricing will be widespread in California for the foreseeable future

Average prices in 2023 and forecast for 2035
CAISO SP15 zone

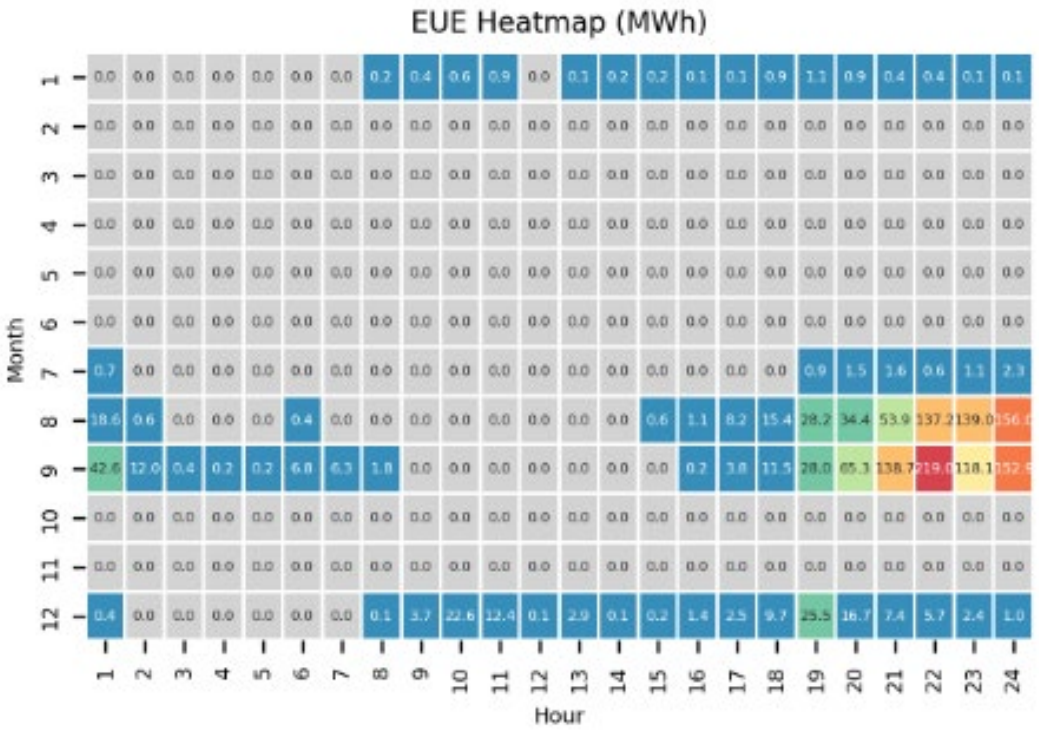


CAISO reliability need is evolving to longer durations due to saturation of solar and short-duration storage

2035: Modeling shows summertime Loss-of-Load events lasting 8-10 hours



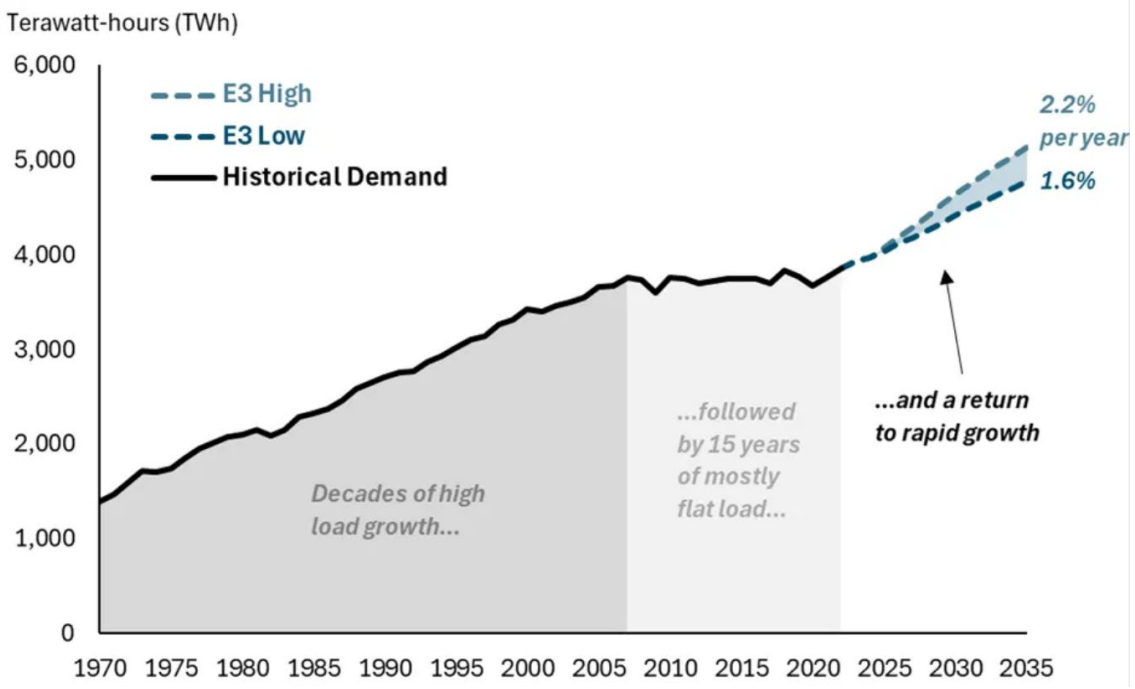
2039: Modeling shows summertime and wintertime loss-of-load events lasting 16-20 hours



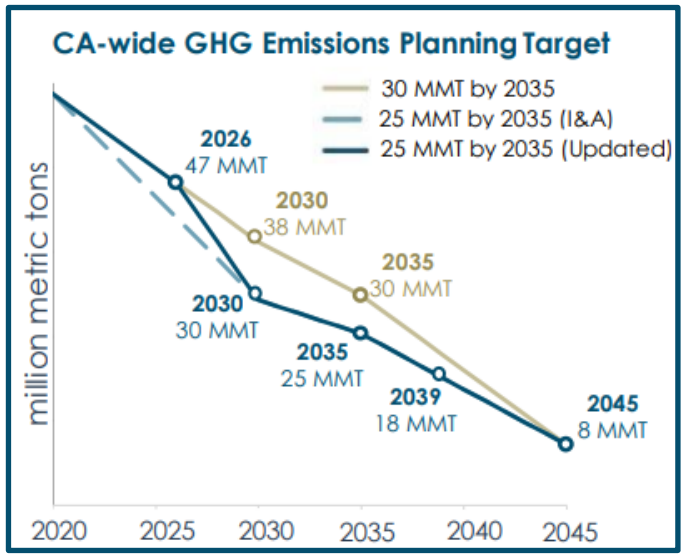
Data centers, AI and electrification are creating significant new demand for electricity

- US and California electricity demand could double by 2050
- Data centers are competing with utilities and other load-serving entities for both existing and new resources
- Electric vehicles and heat pumps continue to grow in market share and California's carbon policies call for more

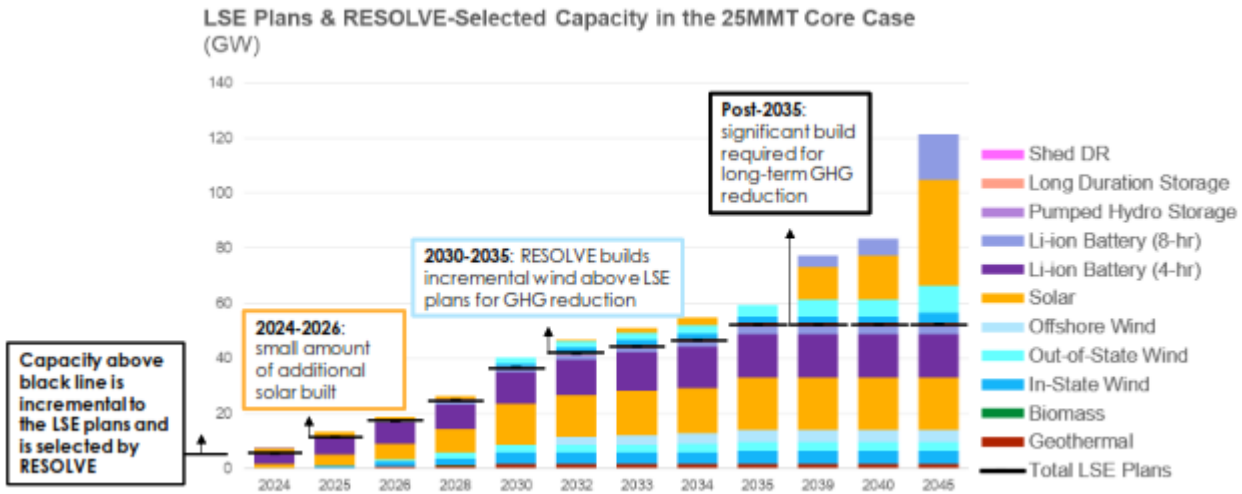
E3 National Load Growth Projections



More resources are needed to meet California's goals



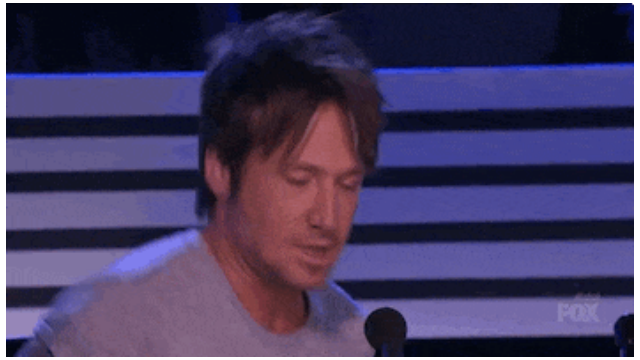
2023 Preferred System Plan



+ The CPUC adopted a carbon emissions target of 25 MMT by 2035

+ Requires an additional 50 GW of clean resources by 2035 and 110 GW by 2045

The new normal for federal policy…



Final thoughts…

- Procurement decisions will be more challenging, and riskier, in the future
- Affordability and uncertainty concerns will leave less room to maneuver, even for lower-cost municipal utilities
- Many utilities are taking a “wait-and-see” approach

Thank you!

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