

Market Outlook Webinar **Forecasts for California and the Broader U.S. West for 2023 - 2030**

Sergio Dueñas
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Our CESA Board Members



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Antora Energy

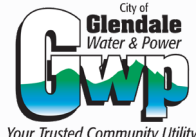
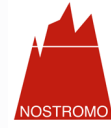
Aquifer Based Hydroelectric Systems



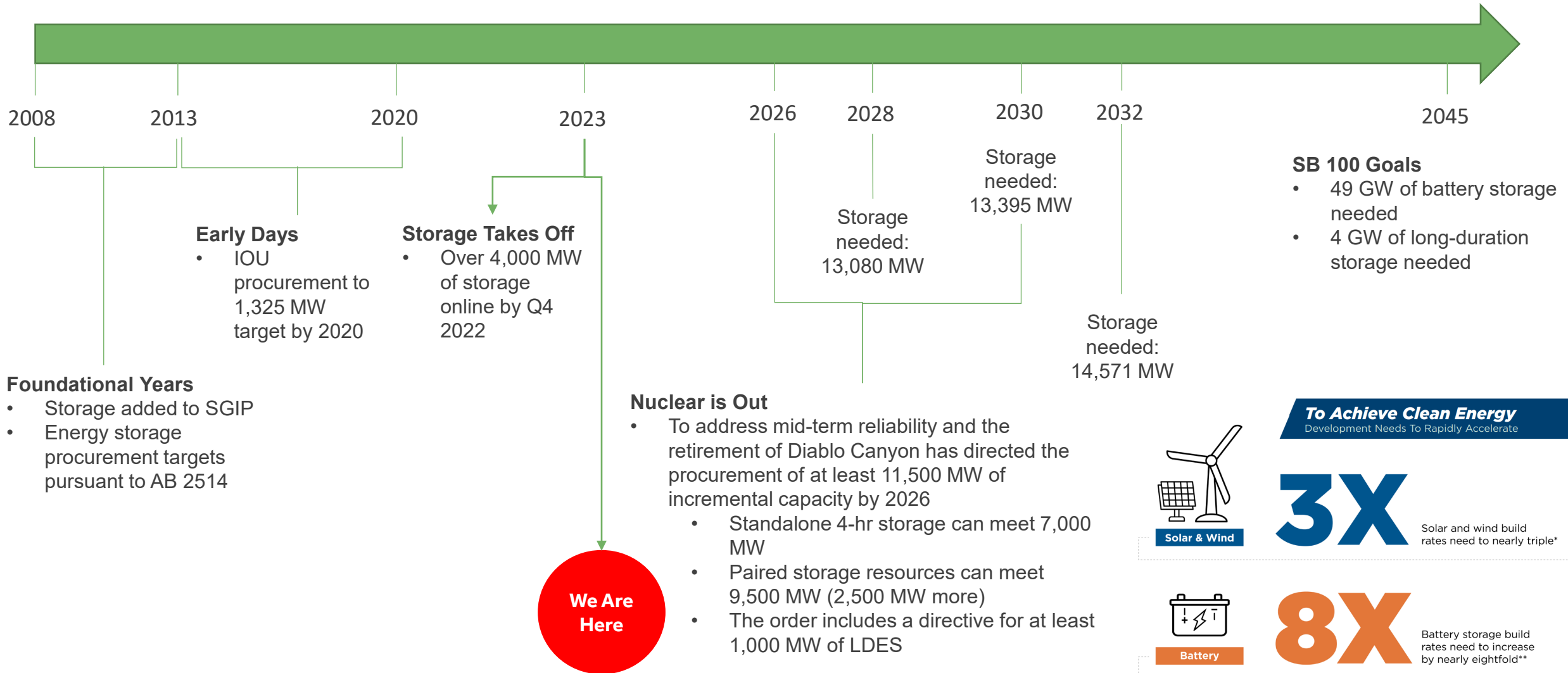
aypa



Better Energies



A Brief History of Storage in California



Foundational Years

- Storage added to SGIP
- Energy storage procurement targets pursuant to AB 2514

Early Days

- IOU procurement to 1,325 MW target by 2020

Storage Takes Off

- Over 4,000 MW of storage online by Q4 2022

Nuclear is Out

- To address mid-term reliability and the retirement of Diablo Canyon has directed the procurement of at least 11,500 MW of incremental capacity by 2026
 - Standalone 4-hr storage can meet 7,000 MW
 - Paired storage resources can meet 9,500 MW (2,500 MW more)
 - The order includes a directive for at least 1,000 MW of LDES

To Achieve Clean Energy
Development Needs To Rapidly Accelerate



Solar & Wind

3X

Solar and wind build rates need to nearly triple*



Battery

8X

Battery storage build rates need to increase by nearly eightfold**

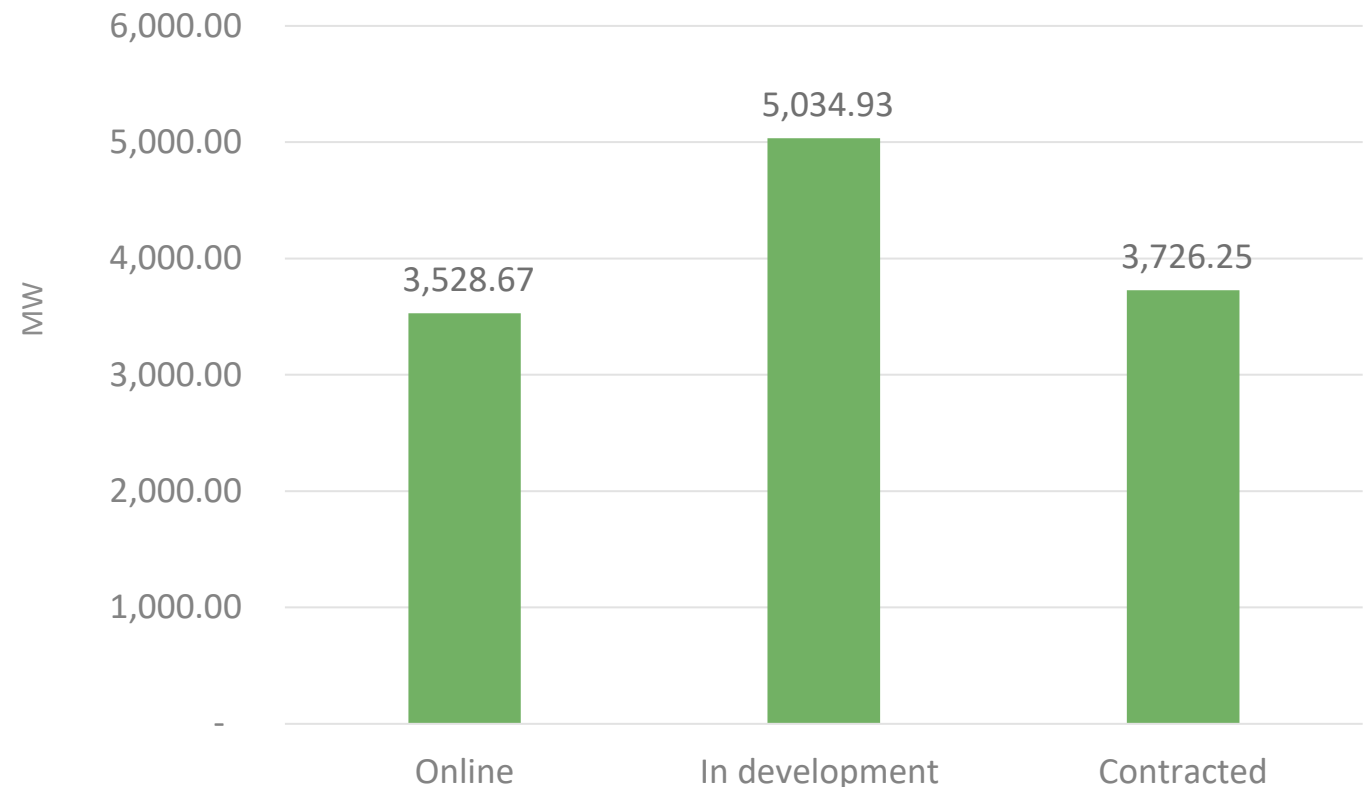
*Based on 10-year average | **Based on 2020

A Brief History of Storage in California

Where we were at in 2022

- By August 2022, CAISO reported aggregate storage real-time dispatches reached 2,300 MW
 - Preliminary September 2022 data suggests maximum above 3.2 GW (9/5)!
- CESA's California Storage Procurement Tracker identifies over 12.3 GW of active storage procurements

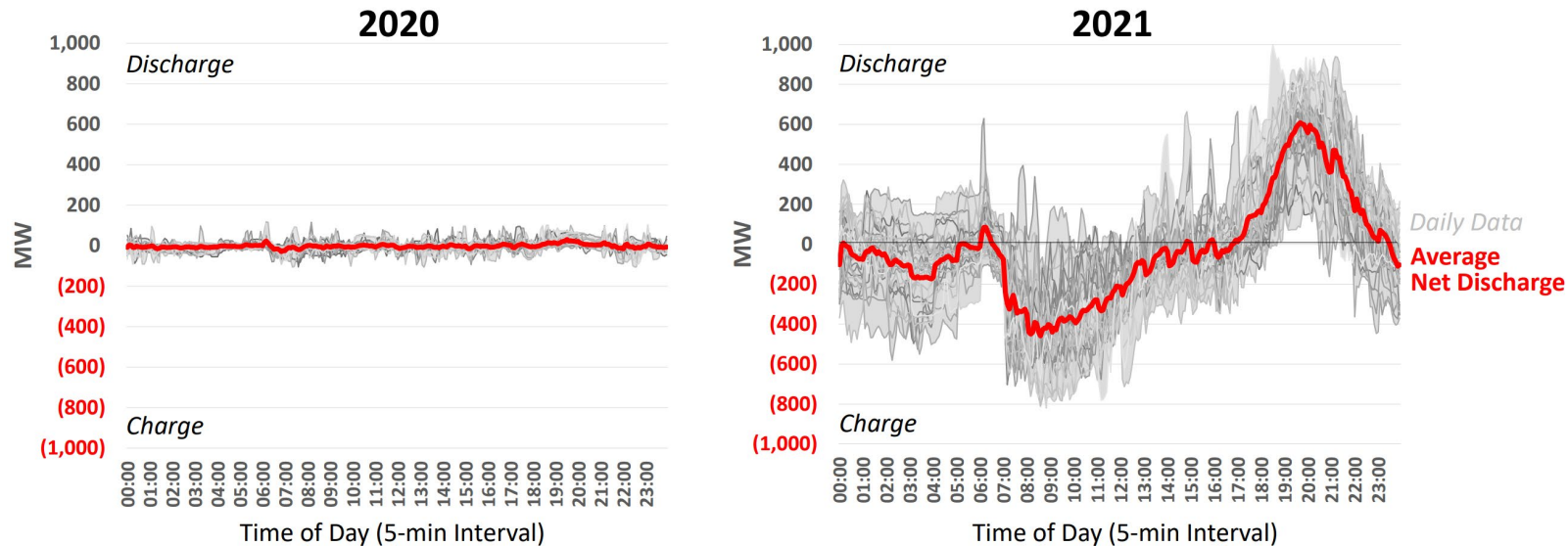
Chart 1. Energy storage procurement since 2010 by status (MW)



A Brief History of Storage in California

Energy storage operations are evolving as expected toward energy arbitrage

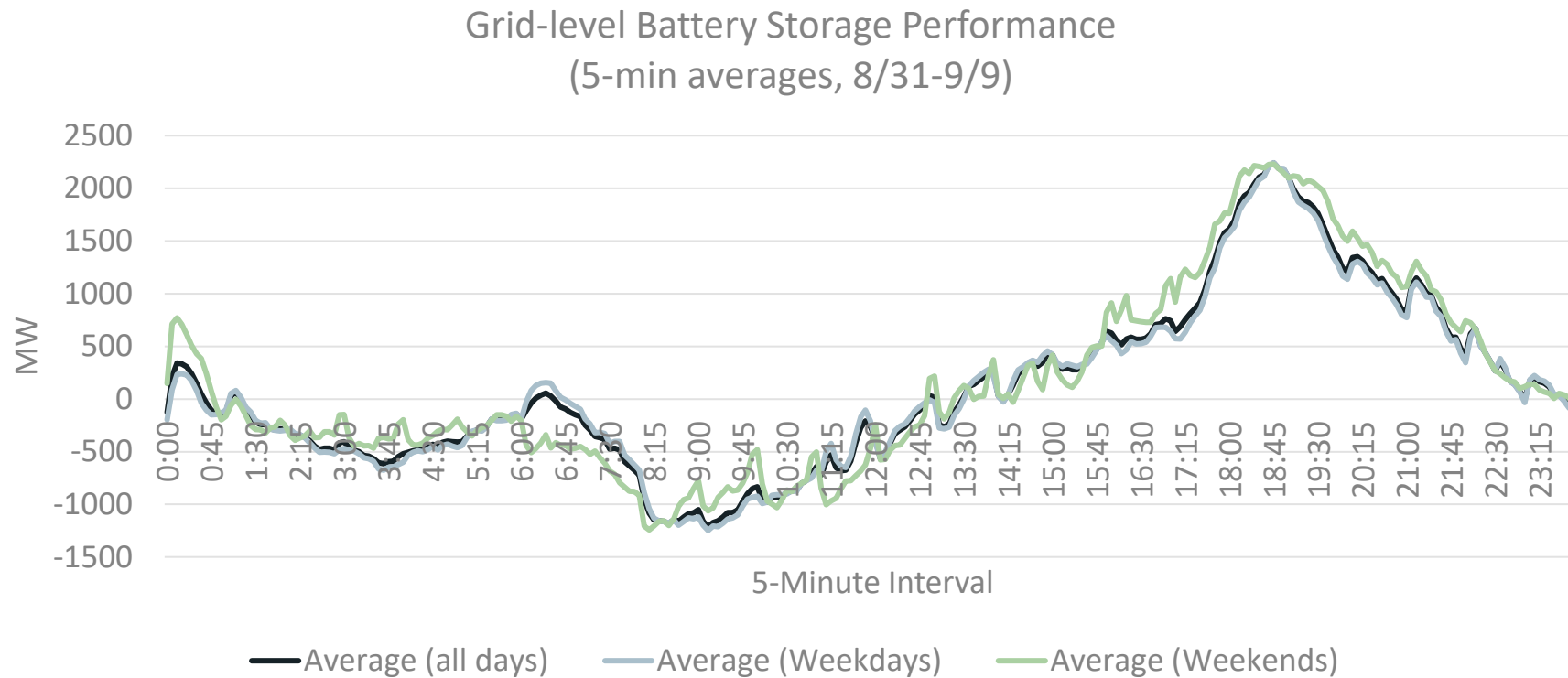
CAISO Aggregate Battery Output (June 10–July 10)



Source: Lumen (Energy Storage Procurement Workshop, September 30, 2021)

A Brief History of Storage in California

Energy storage operations are evolving as expected toward energy arbitrage



Source: CESA (Energy Storage Beat the Heat and It Can Do Much More, September 15, 2022)

Drivers of Need in California

Energy and Environmental Goals and Mandates

- Senate Bill (SB) 350: 60% Renewables Portfolio Standard by 2030
- SB 100: 100% of retail electricity sales must come from zero-carbon resources by December 31, 2045

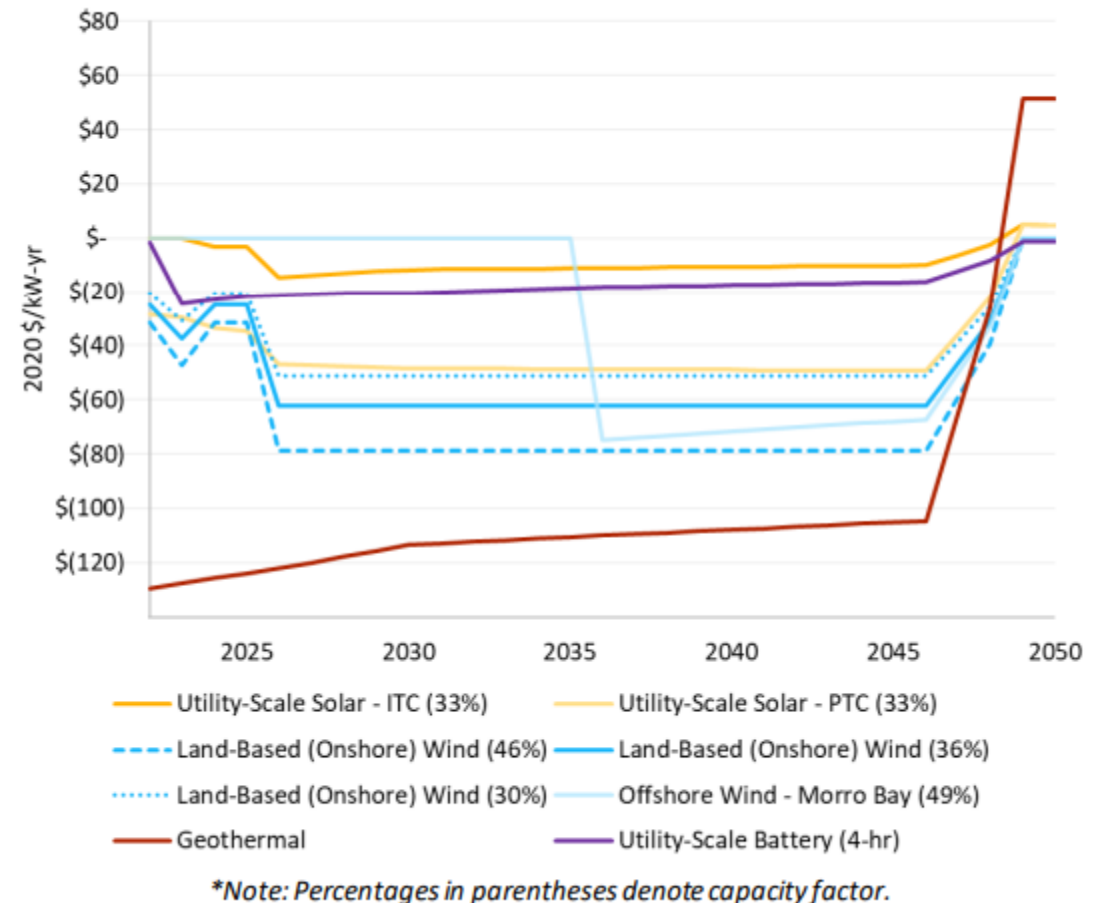
Extreme Weather

- Heat domes events 2020-2022 have been defined as 1 in 30 to 1 in 1000 years events

Availability of Tax Incentives

- The Inflation Reduction Act (IRA) extends tax credits for renewables until 2030, allows for the production tax credit (PTC) to be applied to a broad range of technologies, and creates new credits for standalone storage, and clean hydrogen, among other technologies

Total "All-in" Levelized Fixed Cost Change due to IRA



Source: CPUC (Inputs and Assumptions Modeling Advisory Group Meeting, September 22, 2022)

Future Storage Needs in California

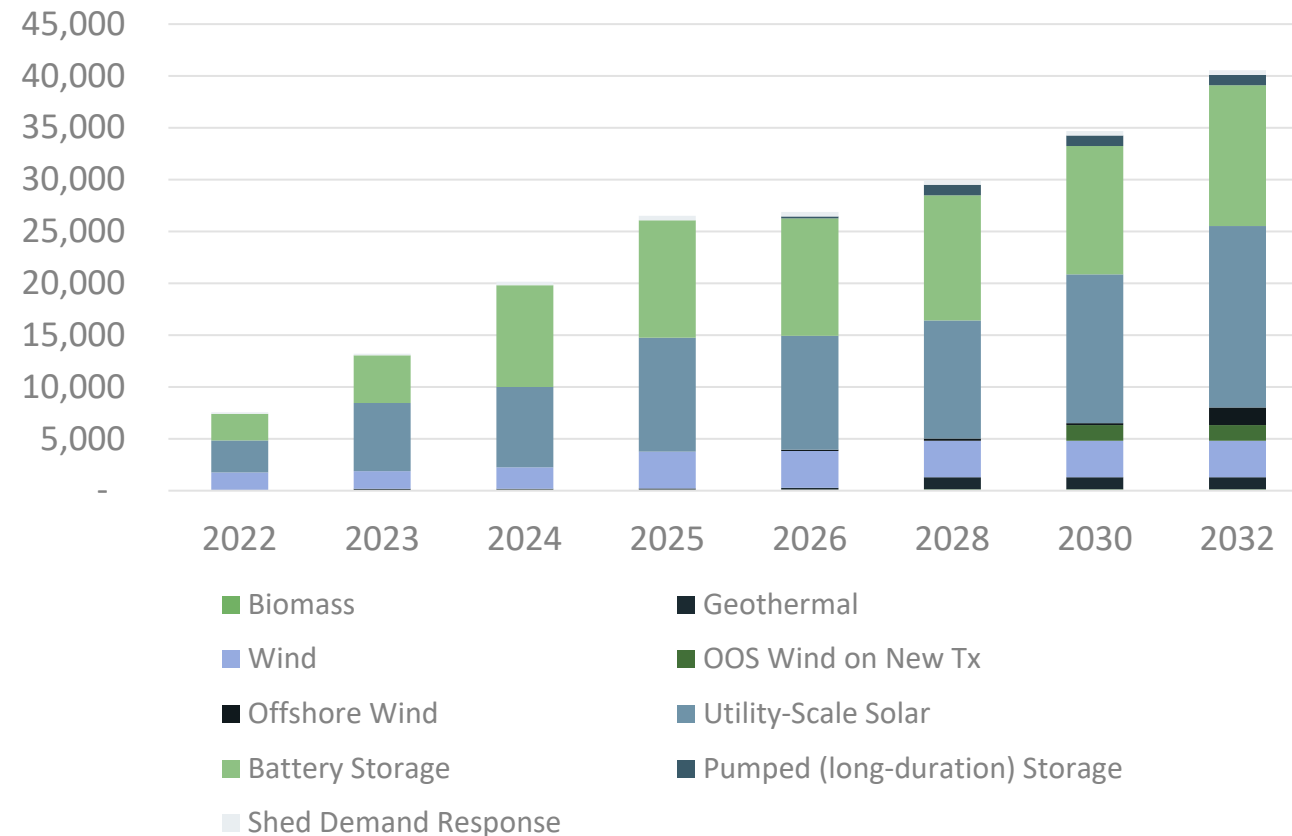
The CPUC's Integrated Resource Planning

- The 2021 Preferred System Plan (PSP) only covers CPUC-jurisdictional entities and includes almost 14 GW of storage by 2032
- The PSP assumes very rapid development of Mid-Term Reliability resources, through 2026

SB 100 Reports

- These reports consider all of California and conclude almost 50 GW of storage will be needed by 2045

New Resource Buildout under the 2021 Preferred System Plan (MW)



Future Storage Needs in California



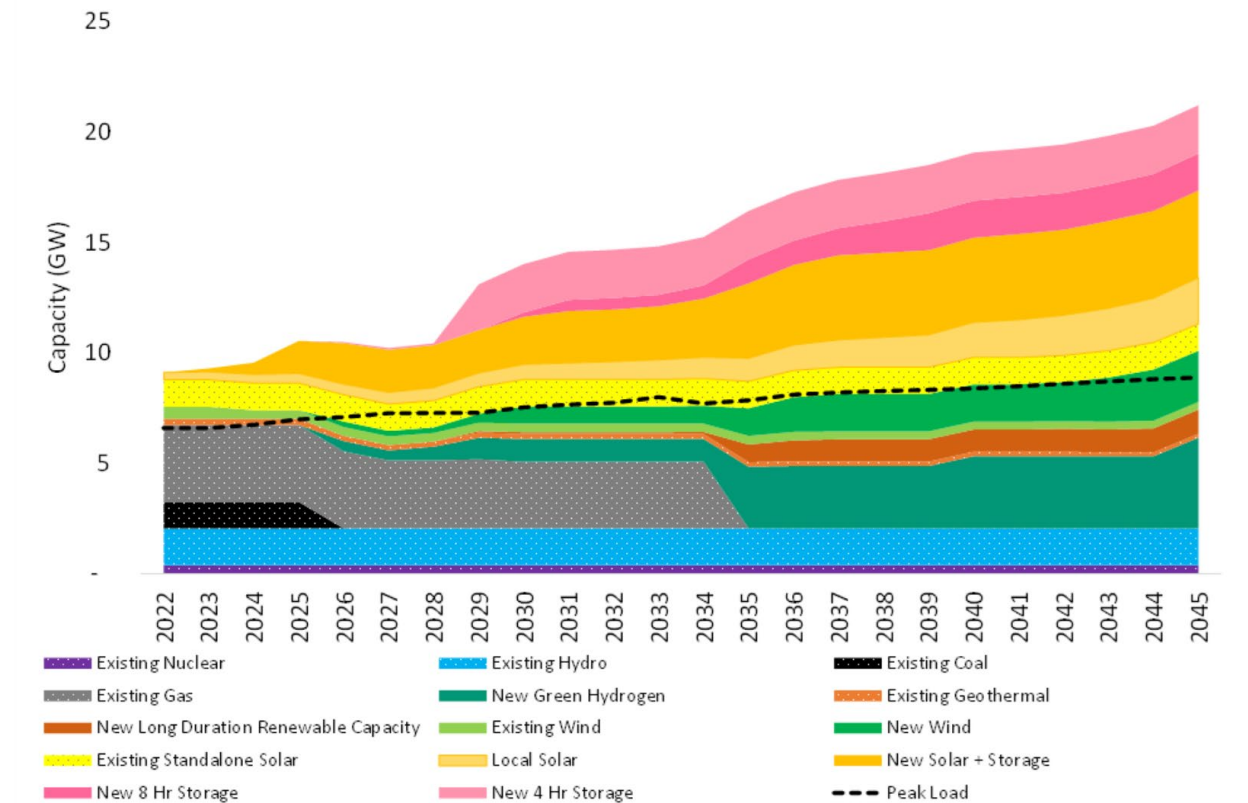
SCENARIOS (100% Carbon Free by 2035)



Future Storage Needs in California

LADWP Case 1 preliminary results

- A significant fraction of natural gas capacity is converted to green hydrogen
- Approximately 5 GW of solar plus storage are deployed
- Increased renewable penetration spurs development of 4- and 8-hour storage



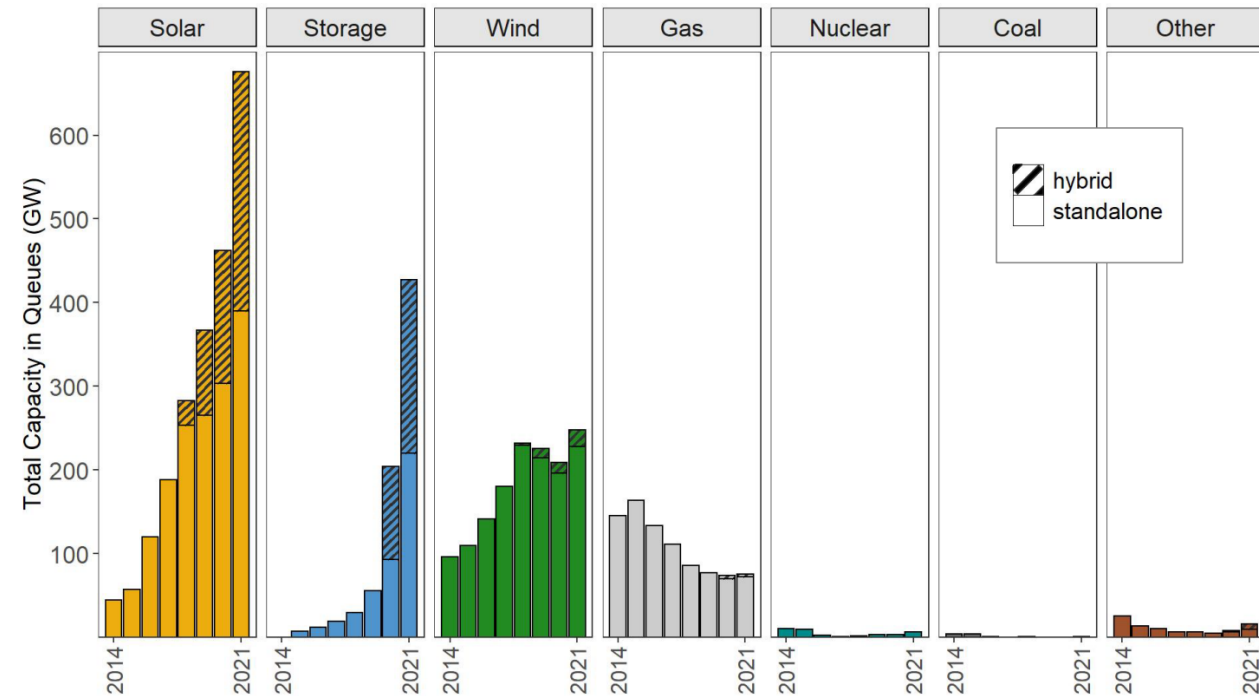
Challenges Ahead in California

Interconnection Woes

- Over 1 TW (1000 GW) of generator capacity and 420 GW of storage currently seeking interconnection across the US, ~930 GW of generation being proposed is zero-carbon
- Only ~23% of projects that requested interconnection from 2000-2016 have reached commercial operations; that value is 13% for CAISO

BTM Issues

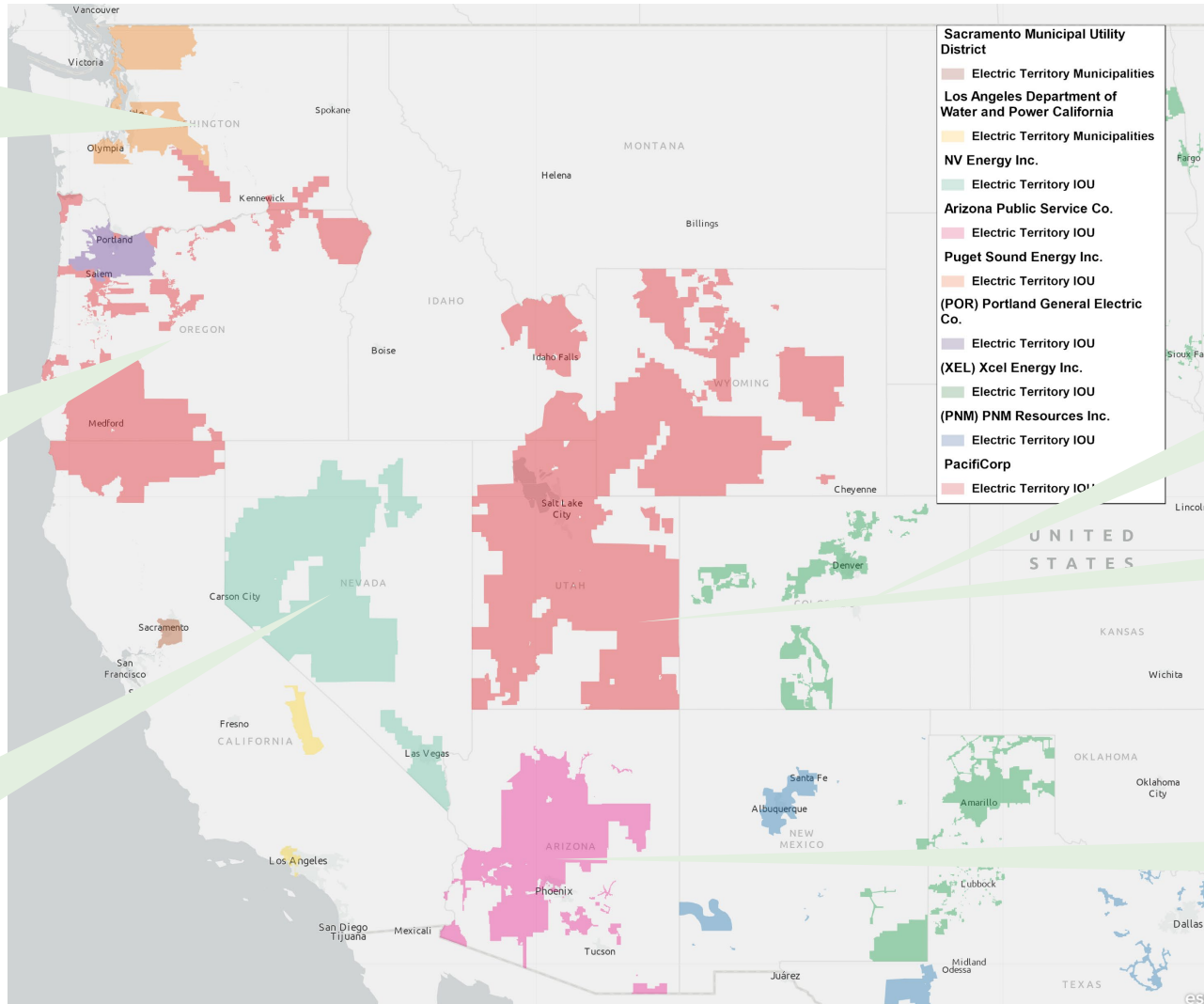
- Long-term BTM model still lacking
- Emergency DR programs (ELRP, DSGS) expected to be temporary



*Hybrid storage capacity is estimated using storage:generator ratios from projects that provide separate capacity data
Storage capacity in hybrids was not estimated for years prior to 2020.
Note: Not all of this capacity will be built



Drivers of Need Across the West



Washington

- 15% RE by 2020
- 100% GHG neutral by 2030; 100% renewable or zero-emitting by 2045

Oregon

- 50% RE by 2040
- 80% below GHG baseline emissions levels by 2030; 90% by 2035; and 100% by 2040

Nevada

- 50% RE by 2030; non-binding 100% carbon-free by 2050

Colorado

- Reduce electric sector GHG emissions by 80% by 2030, and 100% by 2050

Utah

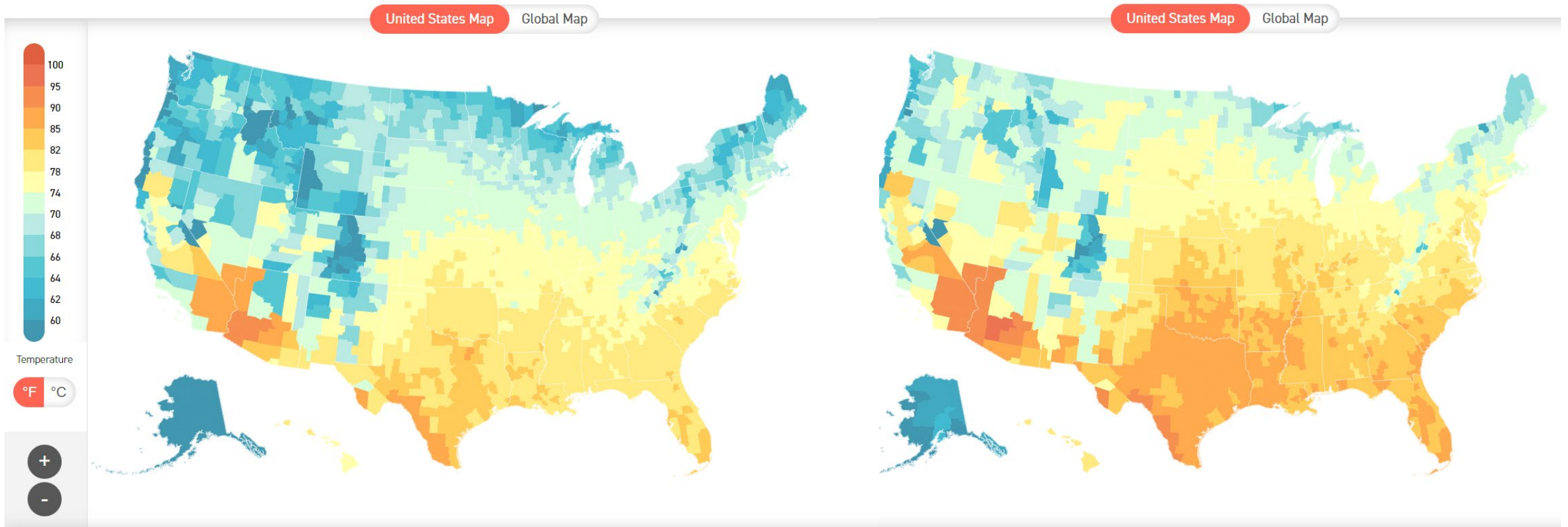
- 20% RE by 2025

Arizona

- 15% RE by 2025

Drivers of Need Across the West

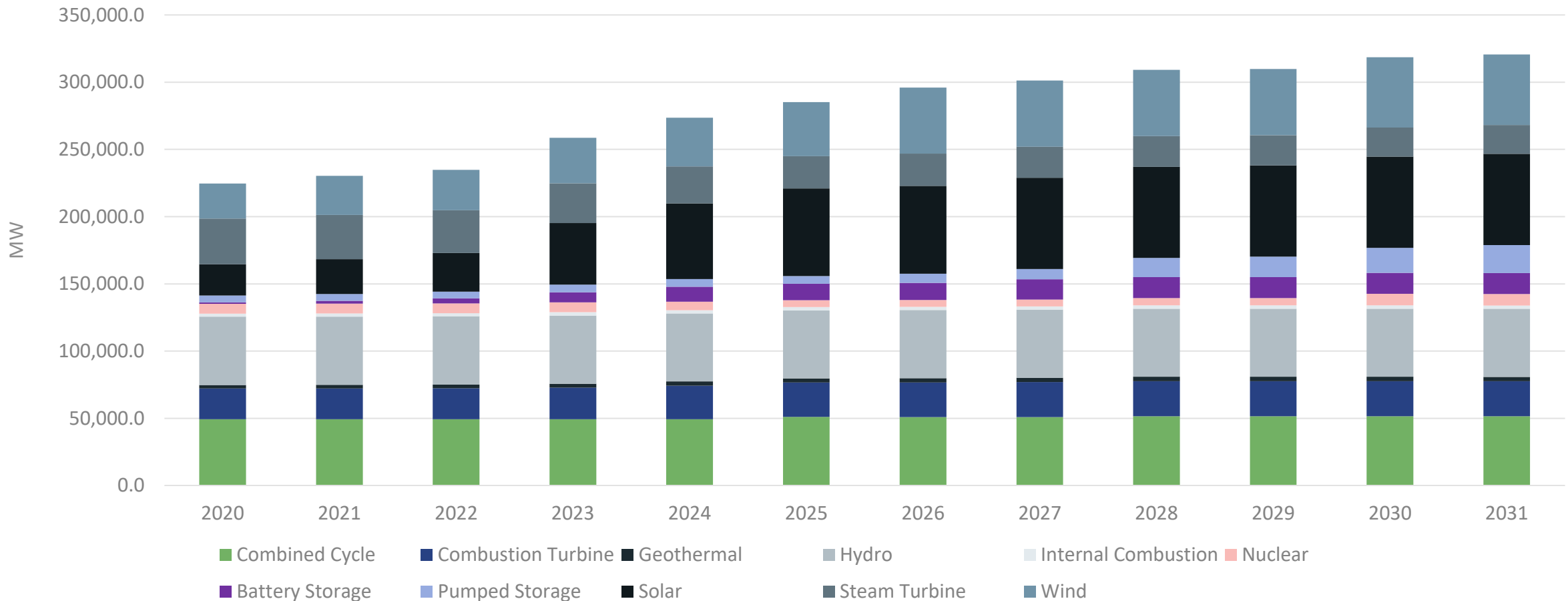
Historical (1981-2010) vs Mid-Century (2040-2059)



Source: Climate Impact Lab (2022)

Future Storage Needs Across the West

Historical and Future Power Plant Capacity in WECC, by technology (S&P)



Source: S&P (2022). Future capacity is based on actual planned/under construction projects, and not based on any projections of unreported new developments or retirements. Estimates are based on ownership, purchase power agreements, interconnected utilities, membership lists (load serving or transmission owning), and geographically based public information.

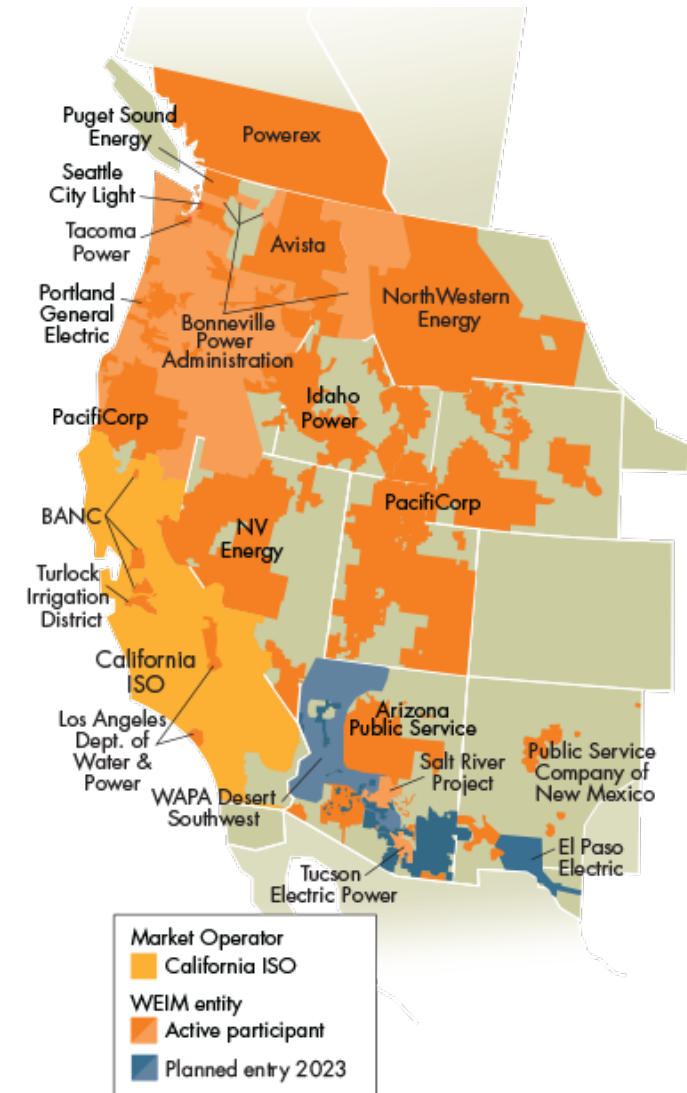
Notable Issues Across the West

Extended Day Ahead Market (EDAM)

- EDAM is a voluntary day-ahead electricity market that will more efficiently and effectively integrate renewable resources and address the significant operational challenges presented by a rapidly changing resource mix, emerging technologies, and the impacts of climate change
- The EDAM design will apply equitably to all EDAM entities, including the ISO, ensuring a level playing field for market participants inside and outside of California

Western Resource Adequacy Program (WRAP)

- The WRAP is the first regional reliability planning and compliance program in the history of the West, seeking greater alignment in resource valuation and procurement



WESTERN ENERGY STORAGE TASKFORCE (WEST)

Shaping and Scaling Western Storage Markets

2023 Cost: \$12,500

What is WEST?

- Monthly working group meetings from January - December
- Covers and tracks emerging developments in Arizona, Colorado, New Mexico, Oregon, Utah and Washington
- Results-driven, action-oriented advocacy aligned with member input

Next meeting
1/20!

Contact us to join WEST: info@storagealliance.org



Please enter in any questions into the chat dialogue

Answers will be provided shortly



THANK YOU

Please contact us at: info@storagealliance.org | www.storagealliance.org

CESAA

The letters 'CESAA' are rendered in a large, bold, sans-serif font. Each letter is filled with a detailed image of a green leaf with several clear water droplets of varying sizes. The background of the entire image is a solid, deep blue.

CALIFORNIA ENERGY STORAGE ALLIANCE