

The Role of CAISO LOLE Modeling in Reliability Planning

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Western Power Trading Forum

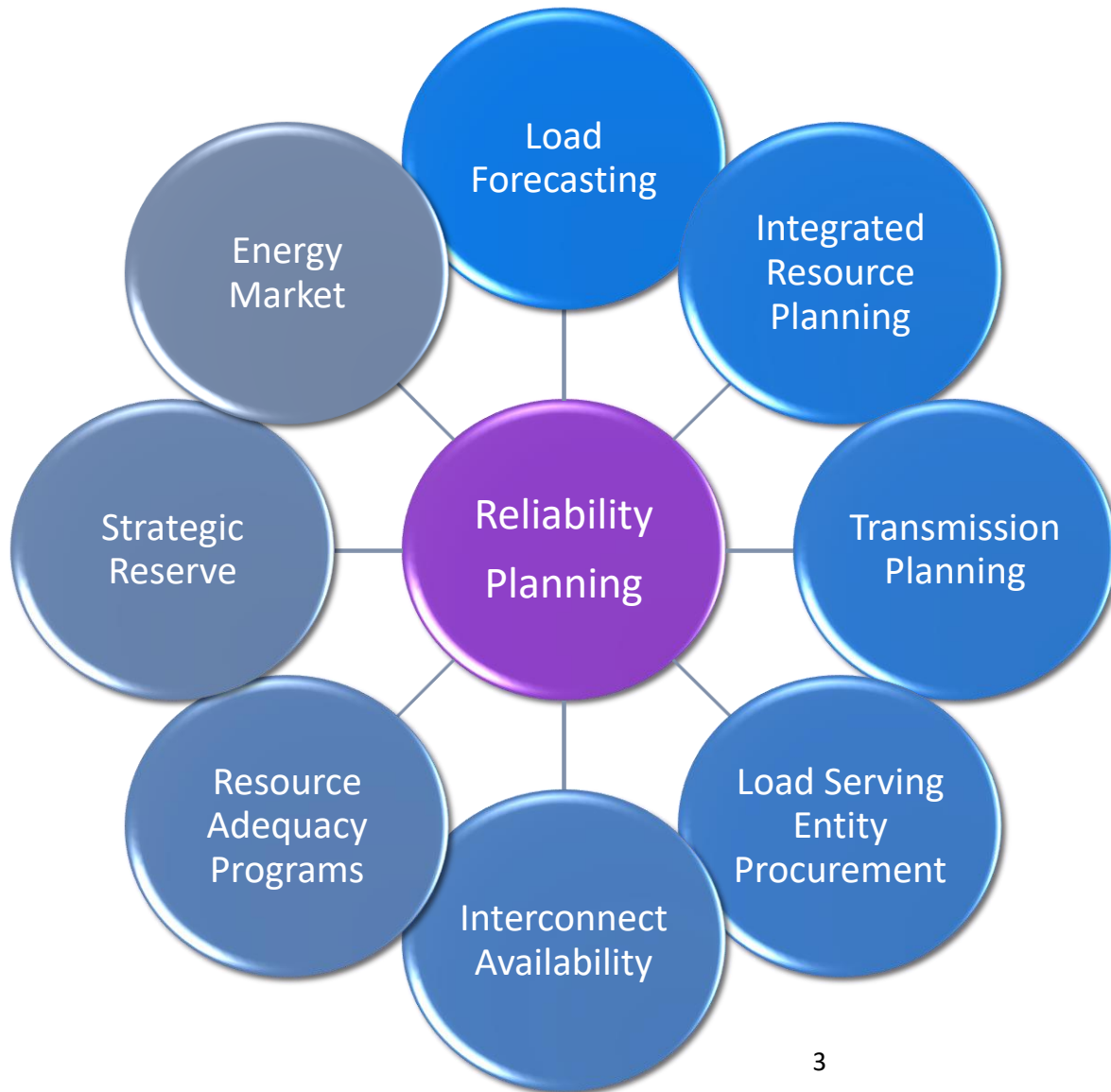
June 18, 2024

About Western Power Trading Forum

- The Western Power Trading Forum (WPTF) is a broad-based industry organization of companies that do business and advocate for competitive market rules throughout the Western Interconnection
- At the CAISO, our advocacy is focused on ensuring fair market rules that are equitable, transparent, and based on economic principles
- Gridwell Consulting runs two committees for WPTF:
 - [CAISO Committee](#)
 - CEC Committee

Learn more about WPTF at www.wptf.org

Presentation Overview



- California Energy Commission (CEC)
- Local Regulatory Authorities (LRAs)
- California ISO (CAISO)
- Department of Water Resources (DWR)
- California Legislature

What is Reliability Planning?

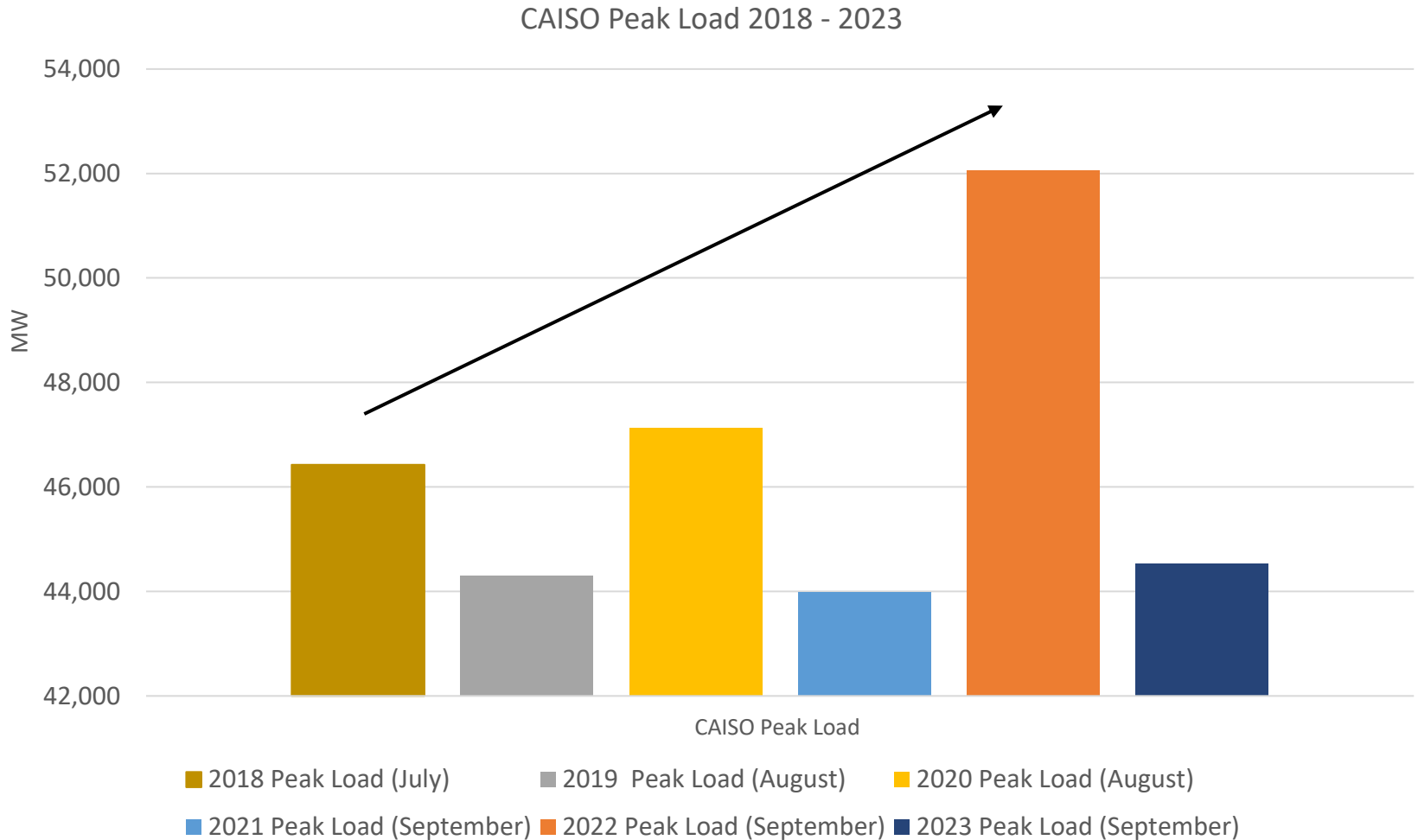
- Reliability planning is making sure there is sufficiency capacity on the system to meet needs in most circumstances
 - This is done by ensuring resources and transmission are developed, needed existing capacity is retained, and ultimately all needed capacity is offered into the energy market
- Sufficient capacity is determined via Integrated Resource Programs and ultimately a Resource Adequacy requirement
- Load forecasting, counting rules for resources, and the planning reserve margin are all different levers that can be pulled to increase or decrease capacity required on the system
- Loss of load expectation (LOLE) modeling is a robust method to probabilistically determine the likelihood of loss of load under different grid conditions given a certain level of capacity on the system
 - LOLE modeling will measure whether the capacity on the system meets an agreed upon reliability standard (commonly 1-in-10 LOLE)

WPTF Position Overview

1. Reliability planning is getting more challenging
2. The CAISO must ensure its Balancing Authority Area (BAA) is sufficiently reliable and in a more meaningful way work in coordination with other state agencies
3. The RA Working Group discussions on *Track 1: Modeling, Default PRM, Default Counting, UCAP, and Ambient Derates* should move into an initiative process that prioritizes scope items that improve coordination and forward planning, specifically:
 - a) Evaluating forward CAISO BAA reliability assessment in terms of Loss of Load Expectation,
 - b) Updating default Planning Reserve Margin (PRM) and default counting rules, and
 - c) Establishing a transparent and comprehensive mothball and retirement process that is based on local needs and the forward BAA LOLE assessment

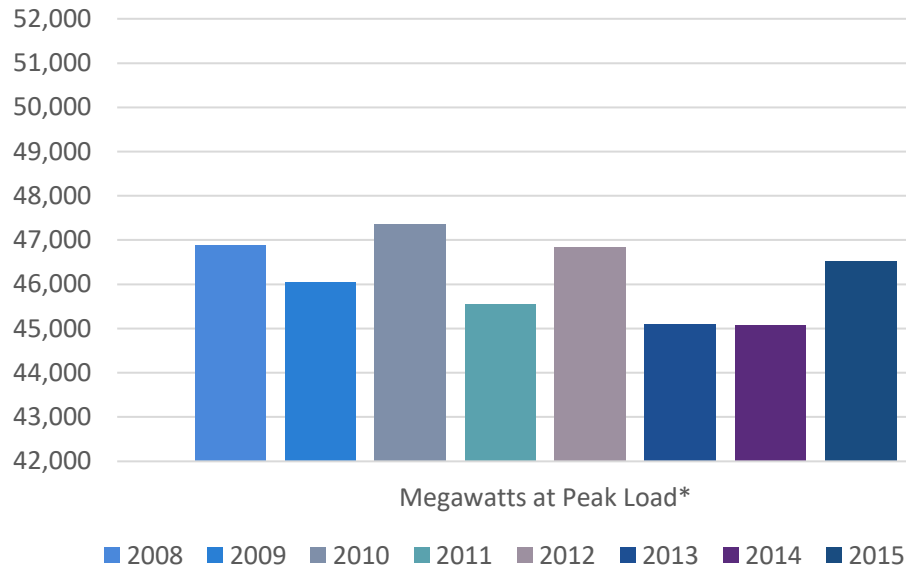
1. Reliability planning is getting more challenging

California peak load is increasing and occurs throughout the summer months (July – Sept)

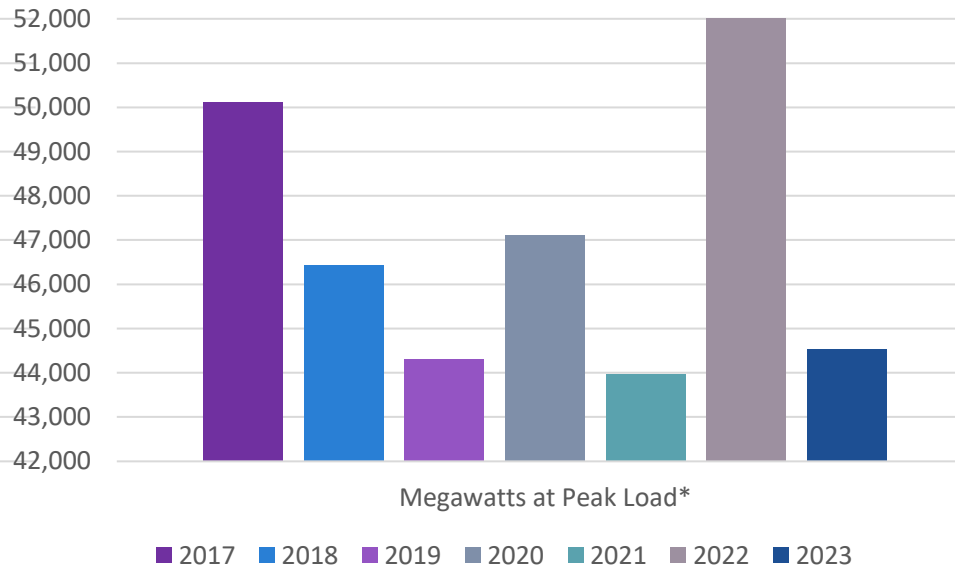


Planning is a lot harder under climate change conditions

CAISO peak load 2008 - 2015

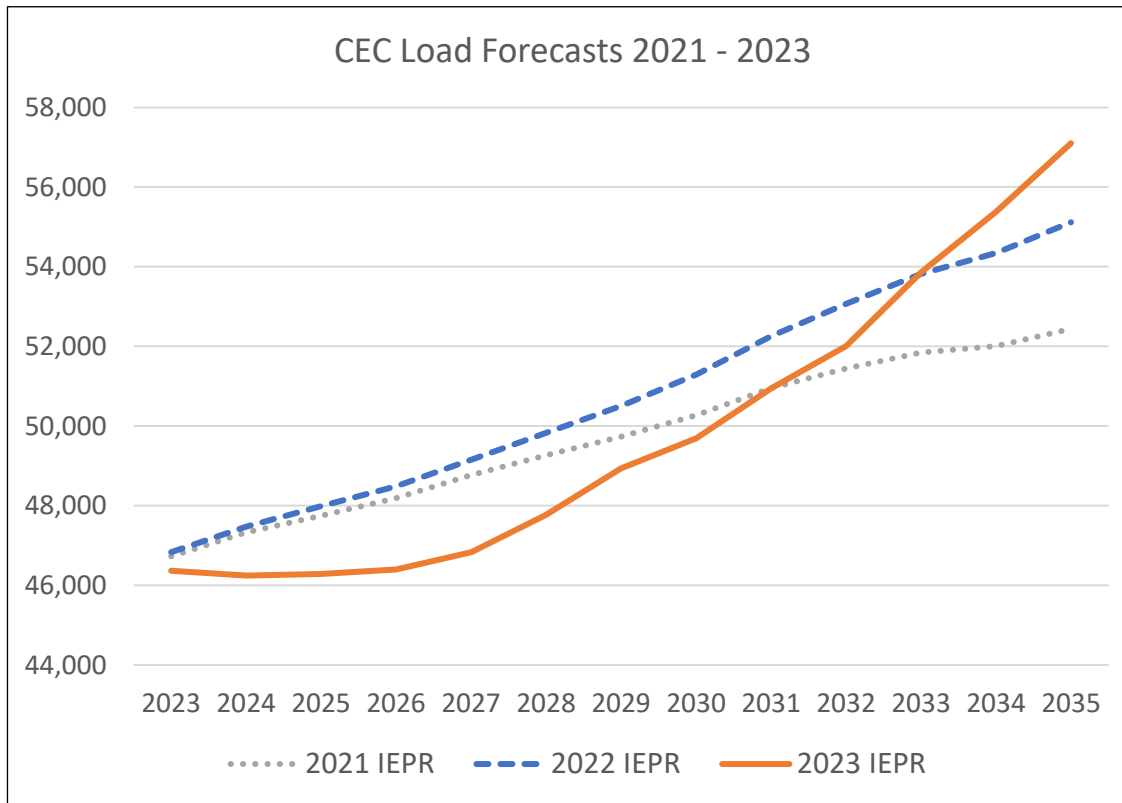


CAISO peak load 2017 - 2023



- Climate change impacts caused a significant increase in the *variability* of load after 2016
- Even more challenging, starting in 2018 the peaks are mostly after 5pm, which is well past the solar peak
- **Reliability planning must be calibrated for climate change going forward**

California Energy Commission (CEC) load forecast



- The CEC uses a 1-in-2 load forecast, which means they expect half the time their forecast to be too low and half the time too high
- The chart compares the 1-in-2 forecast (2023 IEPR) to prior years' IEPRs 1-in-2 load forecast
- The 1-in-2 forecast is significantly below the CAISO's 2022 peak and even below the 2020 peak
- Climate change calibration is needed either via the load forecast OR through other reliability planning processes

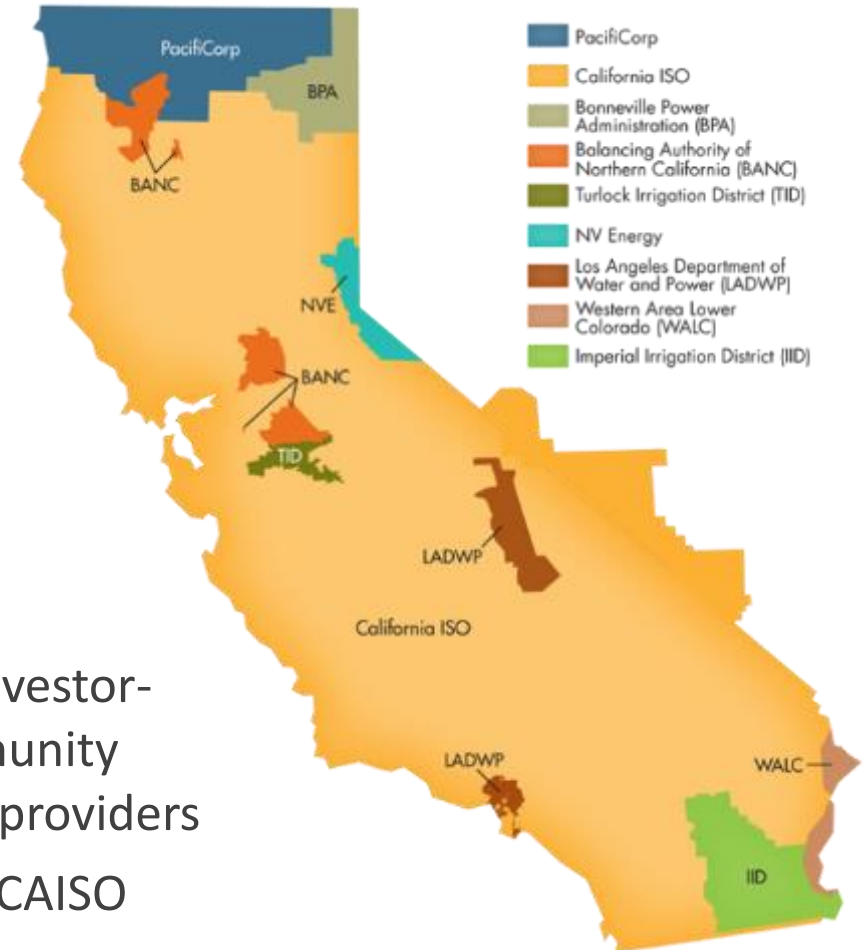
Need for climate change calibration and increased CAISO role in reliability planning

- Resource planning is conducted within so many processes and agencies, it is unclear whether they are fully being calibrated for climate change and whether the CAISO BAA is reliable:
 - Strategic reserve (legislative), load forecasting (CEC), long-term resource planning (LRA/LSE), planning reserve margin and counting rules (LRA/LSE)
- Regulatory agencies can no longer rely on historical methodologies to determine resource adequacy and must calibrate their processes for these climate change impacts
- Climate change impacts both demand for electricity and the resources available to provide electricity
- Resource mix is rapidly changing, with a predictable shock to grid reliability in the form of large amounts of gas retirements on the horizon
 - Clear and present increased need for additional coordination and collaboration by the agencies – and for the CAISO to do this, it must increase its understanding of its own Balancing Area’s reliability

2. The CAISO must ensure its Balancing Authority Area (BAA) is sufficiently reliable and in a more meaningful way work in coordination with other state agencies

California Independent System Operator (CAISO)

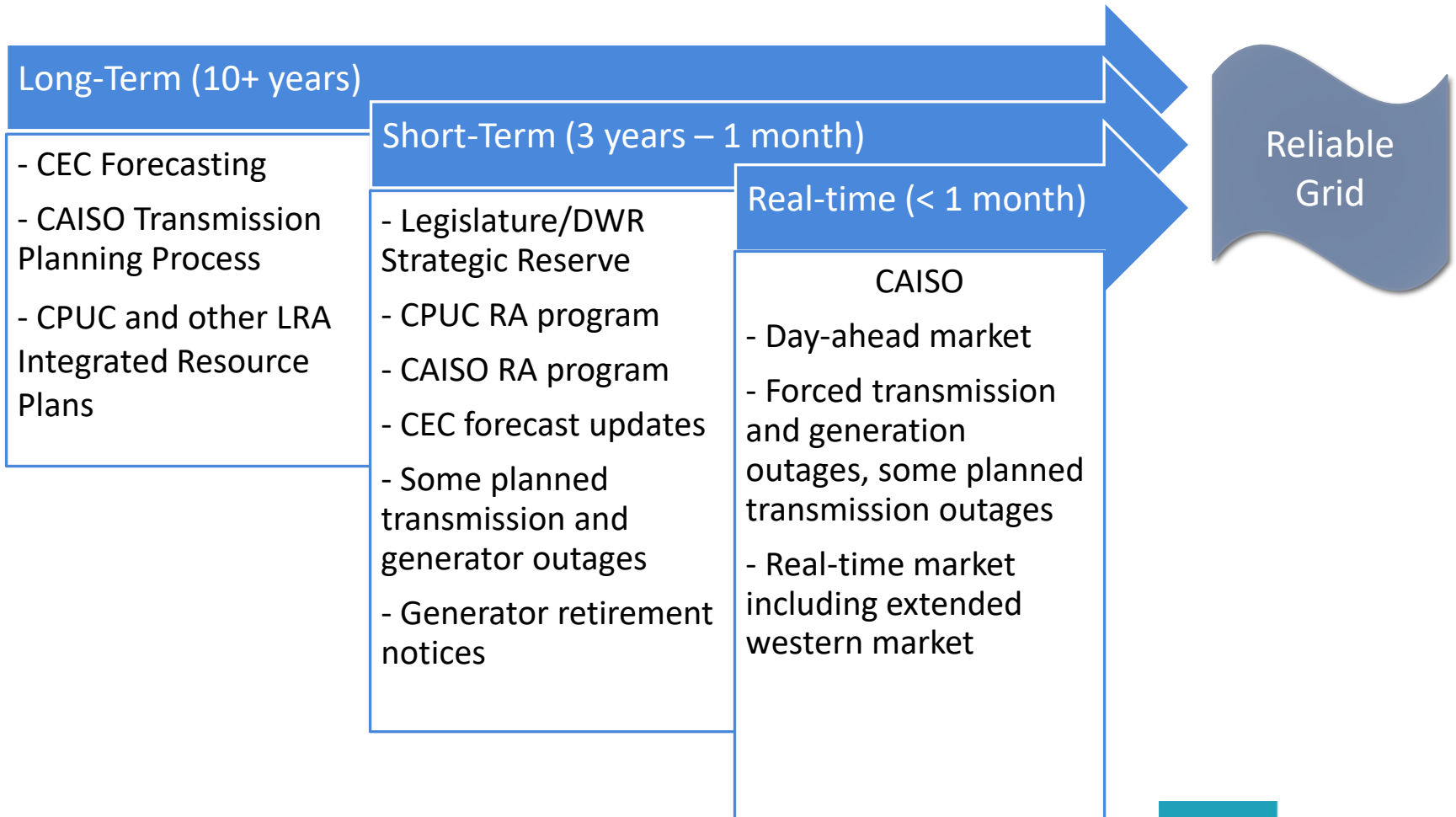
- Federal Energy Regulatory Commission (FERC) jurisdictional
- CAISO BA oversees 80% of CA's electricity demand plus some of Nevada's
- Other 20% of demand is served by publicly owned utilities (LADWP, SMUD, + many other small POU's)
- CAISO has over 70 LSEs, including Investor- and Publicly-Owned Utilities, Community Choice Aggregators, Energy Service providers
- CPUC has jurisdiction over ~91% of CAISO load



Reliability planning agency relationships

- The CAISO, CPUC, CEC, and now DWR via strategic reserve are jointly responsible for grid reliability
- PU Code sec. 380 says that the CPUC shall establish RA requirements “**in consultation with**” the CAISO, which is vague and has been interpreted as the CPUC setting the system-wide reliability level and the CAISO administering it
- NERC and WECC standards require CAISO to have contingency reserves, and CA law implies that CAISO has the power to acquire such reserves
- CAISO has the clearest authority over RA deliverability tests, local and flexible RA rules, unexpected RA need procurement, and generator retirement/mothball approval

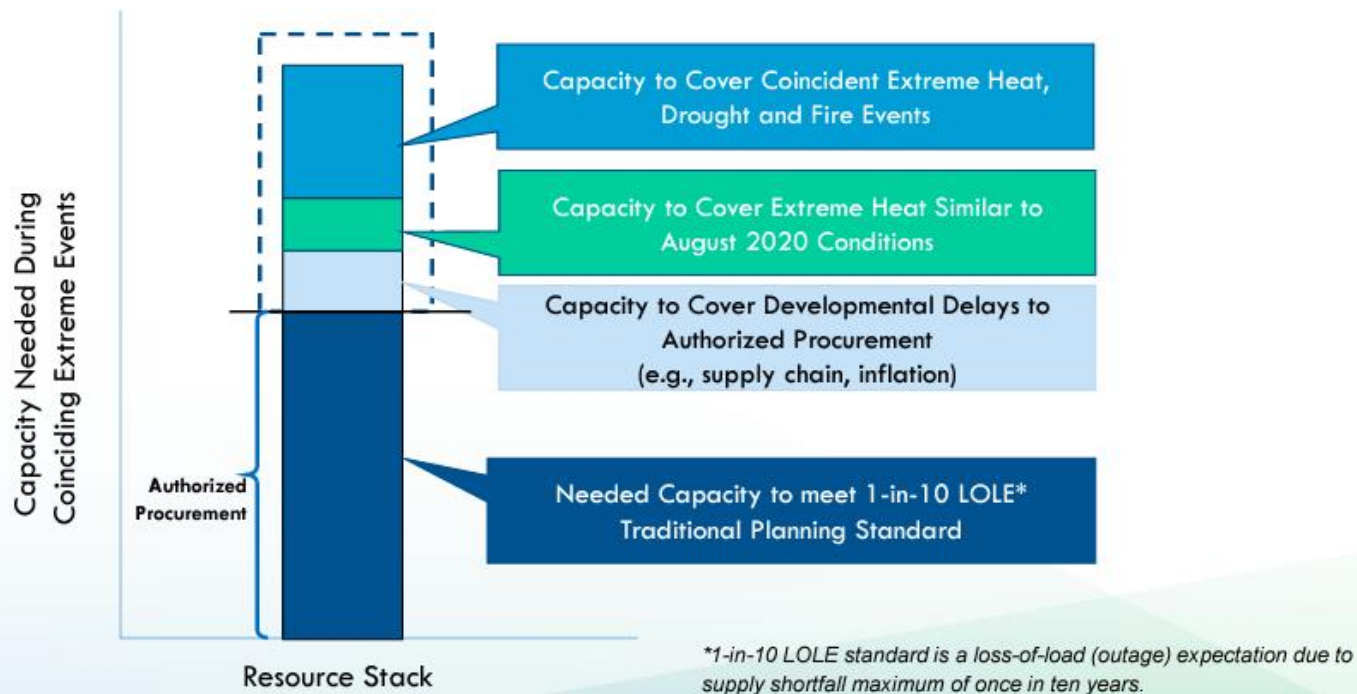
CEC, CPUC, DWR, and CAISO reliability planning timelines



Strategic Reserve overview



Why a Strategic Reliability Reserve?

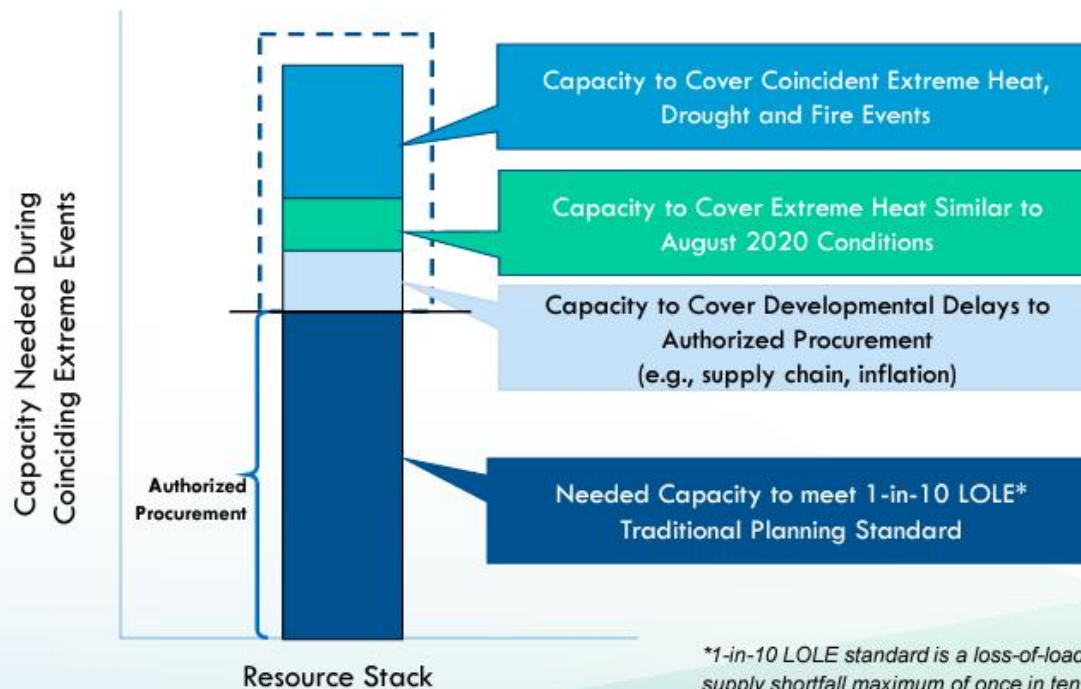


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Strategic Reserve role in reliability planning isn't clear at the study level



Why a Strategic Reliability Reserve?



*1-in-10 LOLE standard is a loss-of-load (outage) expectation due to supply shortfall maximum of once in ten years.

Which bucket does unexpected thermal retirements fall?

How do you differentiate between procurement needed for heat versus procurement needed for extreme heat?

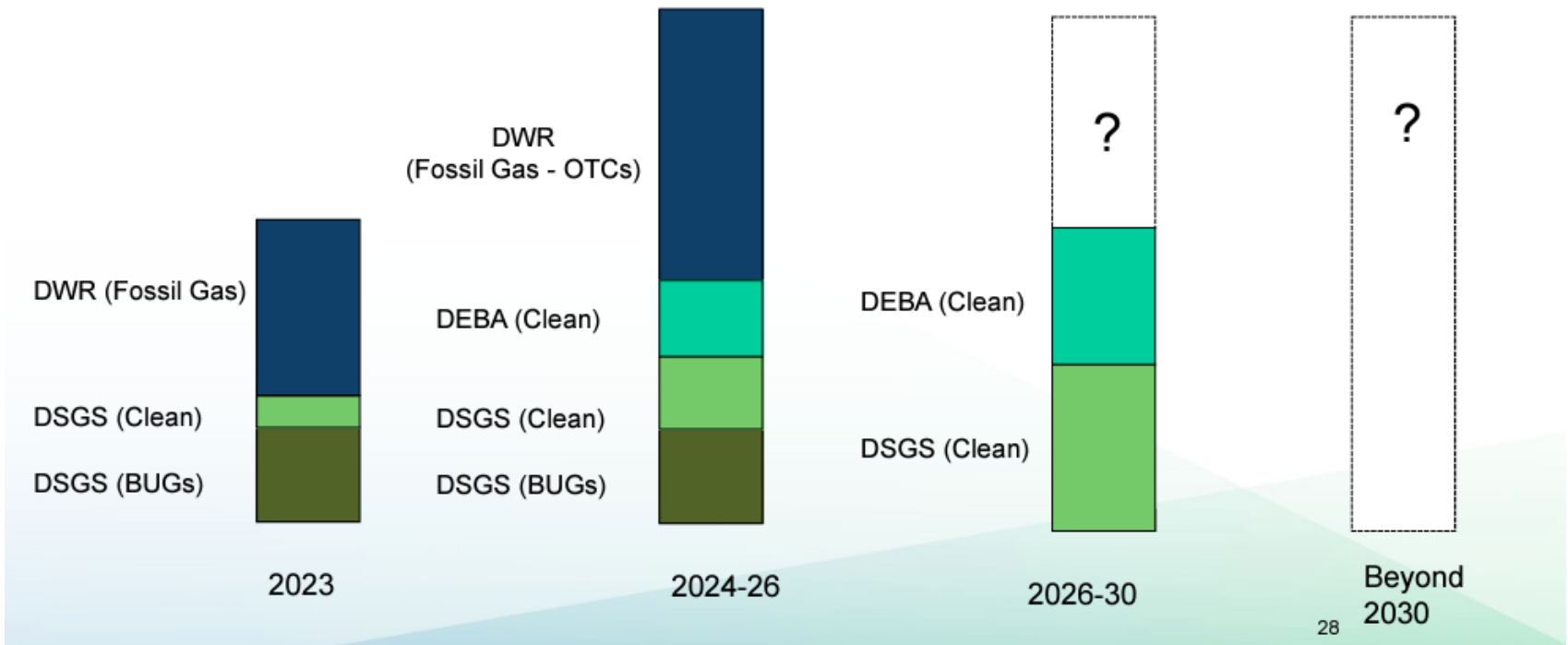
Which bucket accounts for general load forecast error? Is error due to climate change different than error due to other reasons?

Strategic Reserve post-2026 uncertain



Strategic Reliability Reserve (SRR) – Long-Term Vision

DSGS / DEBA help transition SRR to clean contingency resources – away from dependency on OTCs



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CAISO's role in reliability planning should be increased

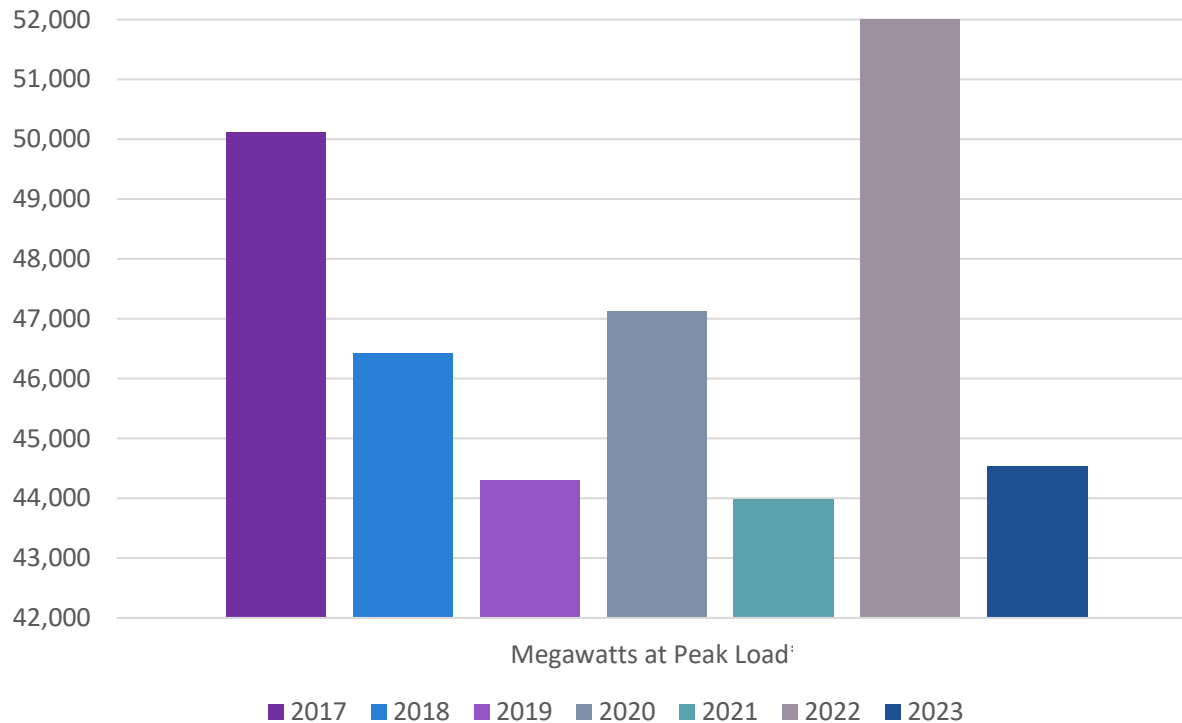
- PU Code sec. 380 says that the CPUC shall establish RA requirements “**in consultation with**” – and to be a good partner and consultant, the CAISO should be able to provide reciprocal information and analysis about its expectations of supply and the value of that supply within its Balancing Authority Area (BAA)
- CAISO is uniquely suited to evaluate how the different agency program elements are coming together to ensure reliability for their BAA
- CAISO also has specific tariff authority over key reliability planning elements that WPTF believes should be updated for climate change impacts and modern reliability needs

3. The RA Working Group discussions on Track 1 should move into an initiative process that prioritizes scope items that improve coordination and forward planning

Learn from history and do better

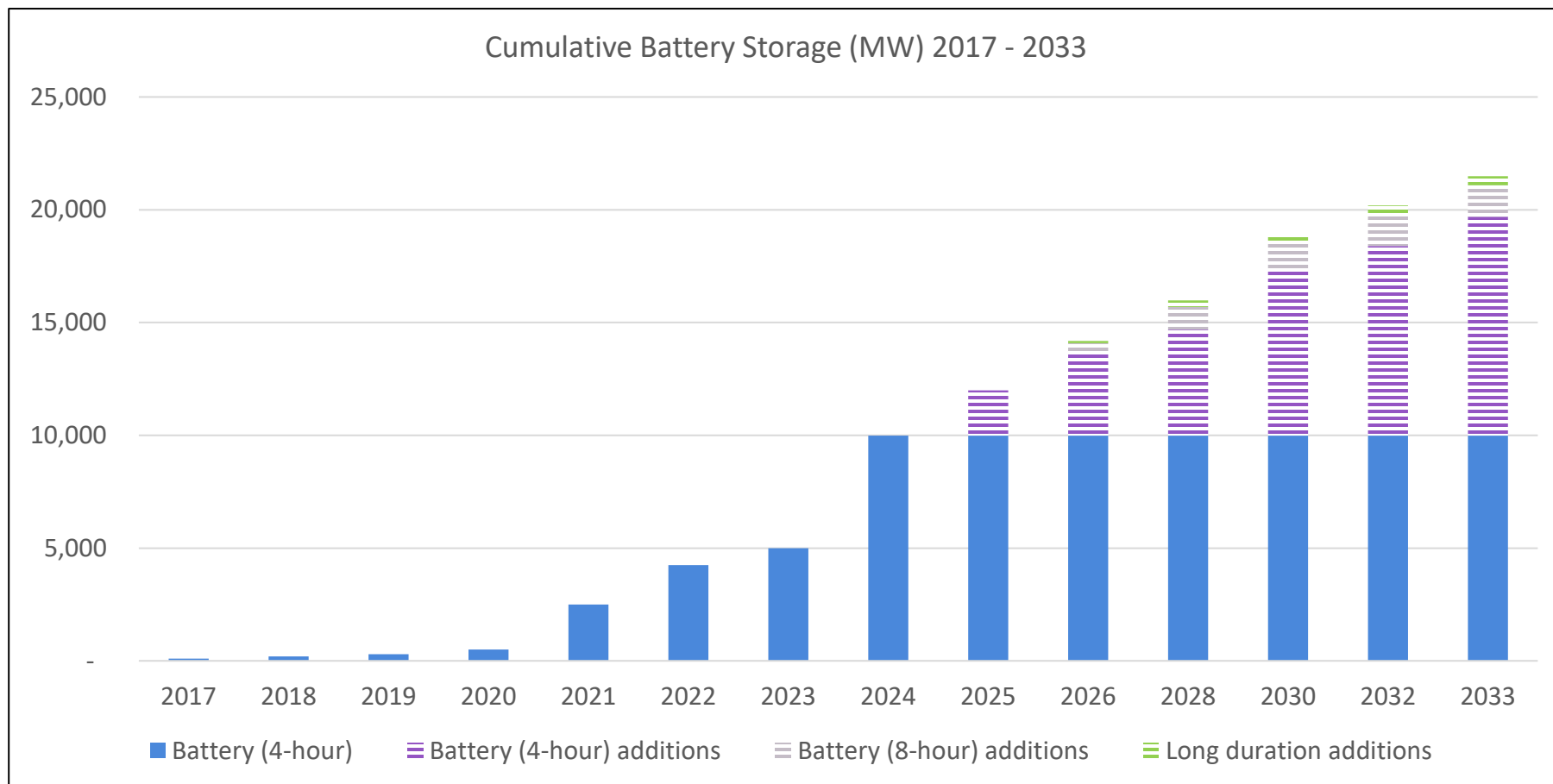
- Why was there a reliability event in 2020 if peak load was 3,000 MW higher only three years prior?
- 5,000 MW of thermal retirement made the difference between tight system conditions and normal system conditions

CAISO peak load 2017 - 2023

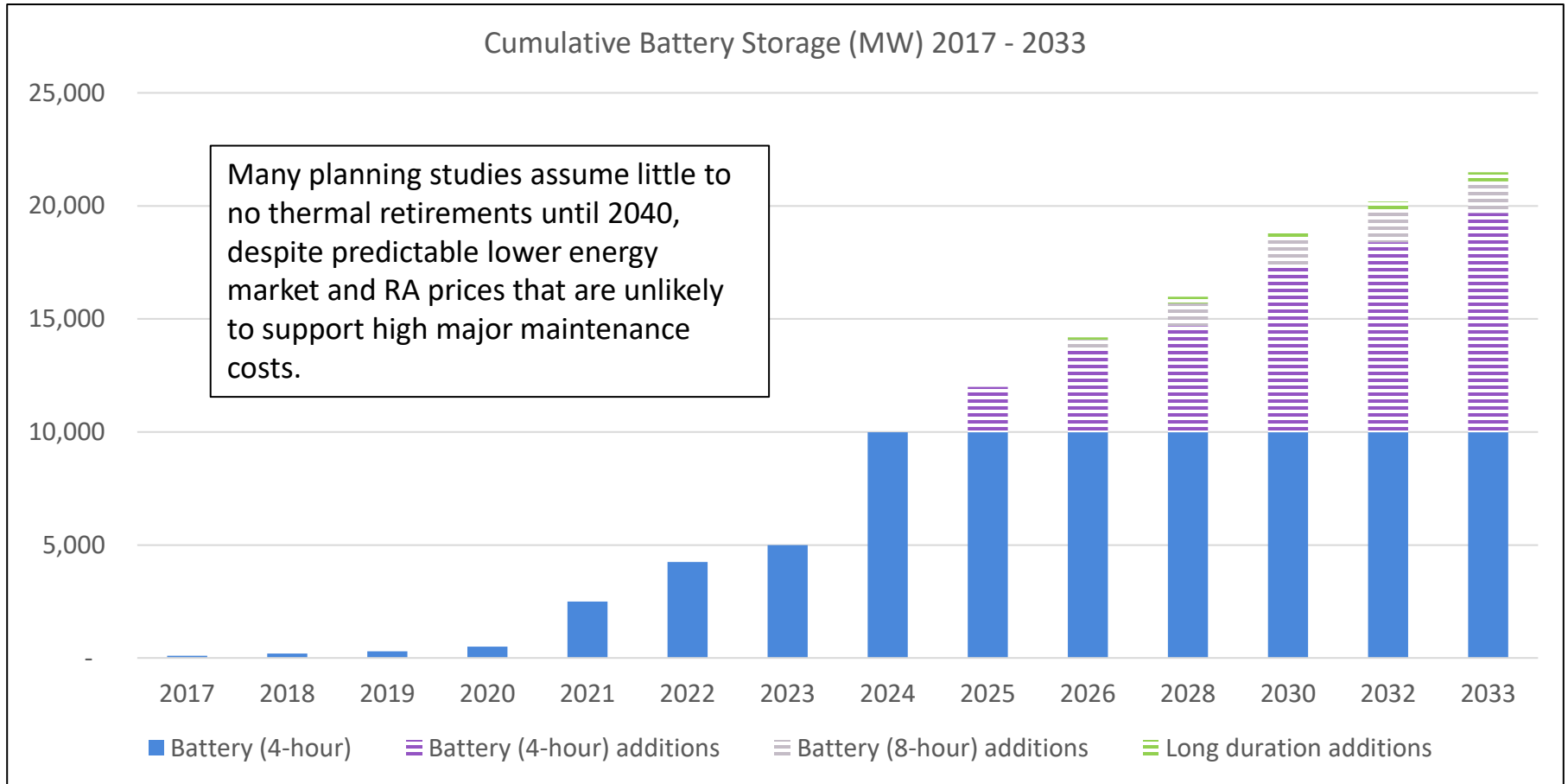


Gas Retirement (Based on NQC)	
< Summer 2016	335
< Summer 2017	2,927
< Summer 2018	430
< Summer 2019	840
< Summer 2020	1,070

Estimated battery storage build-out 2017 - 2033



Estimated battery storage build-out 2017 - 2033



Regulatory agency process gap

- Reliability gap occurs when the CAISO and regulatory agencies can foresee imminent shortage due to gas retirements, but cannot build fast enough or prevent resource retirements due to constraints on CAISO tariff authority

	Year 1	Year 2	Year 3	Year 4	Year 5 – 9	Year 10
CAISO/ CPUC	System RA Program					
CAISO	Retirement Authority			Reliability Gap		Transmission Planning Process
CPUC	Local RA Program					Integrated Resource Program

WPTF proposal

- Reliability gap occurs when the CAISO and regulatory agencies can foresee imminent shortage, but cannot build fast enough or prevent resource retirements

	Year 1	Year 2	Year 3	Year 4	Year 5 – 9	Year 10
CAISO/ CPUC	Local/System RA Program	RCPPP(?)				
CAISO	Loss of Load Expectation Studies and Extension of CAISO Retirement Authority					Transmission Planning Process
CPUC	Local RA Program					Integrated Resource Program

Agency and process coordination

- Increased coordination between the agencies and processes is vitally necessary to ensure reliability over time

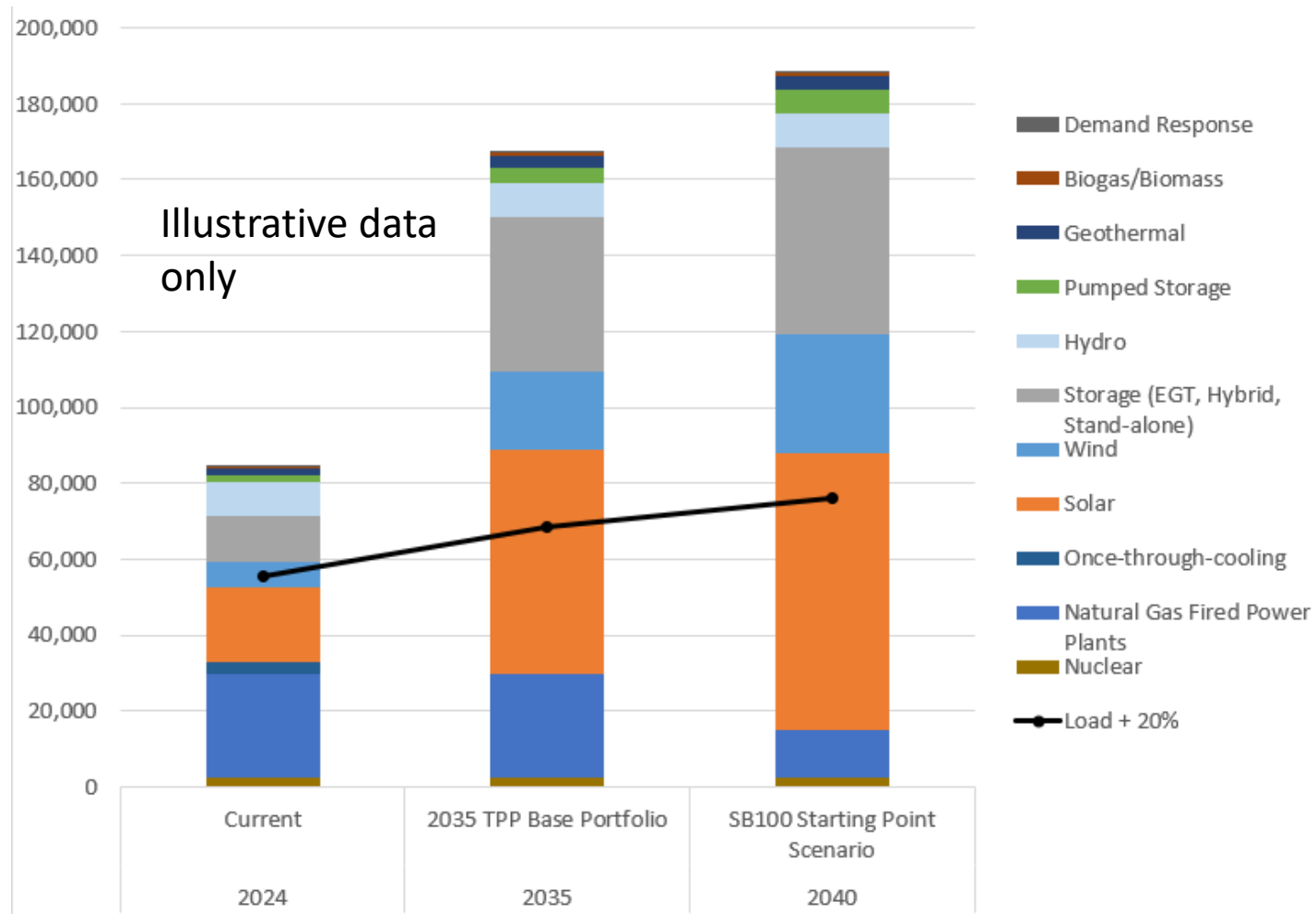
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Strategic Reserve

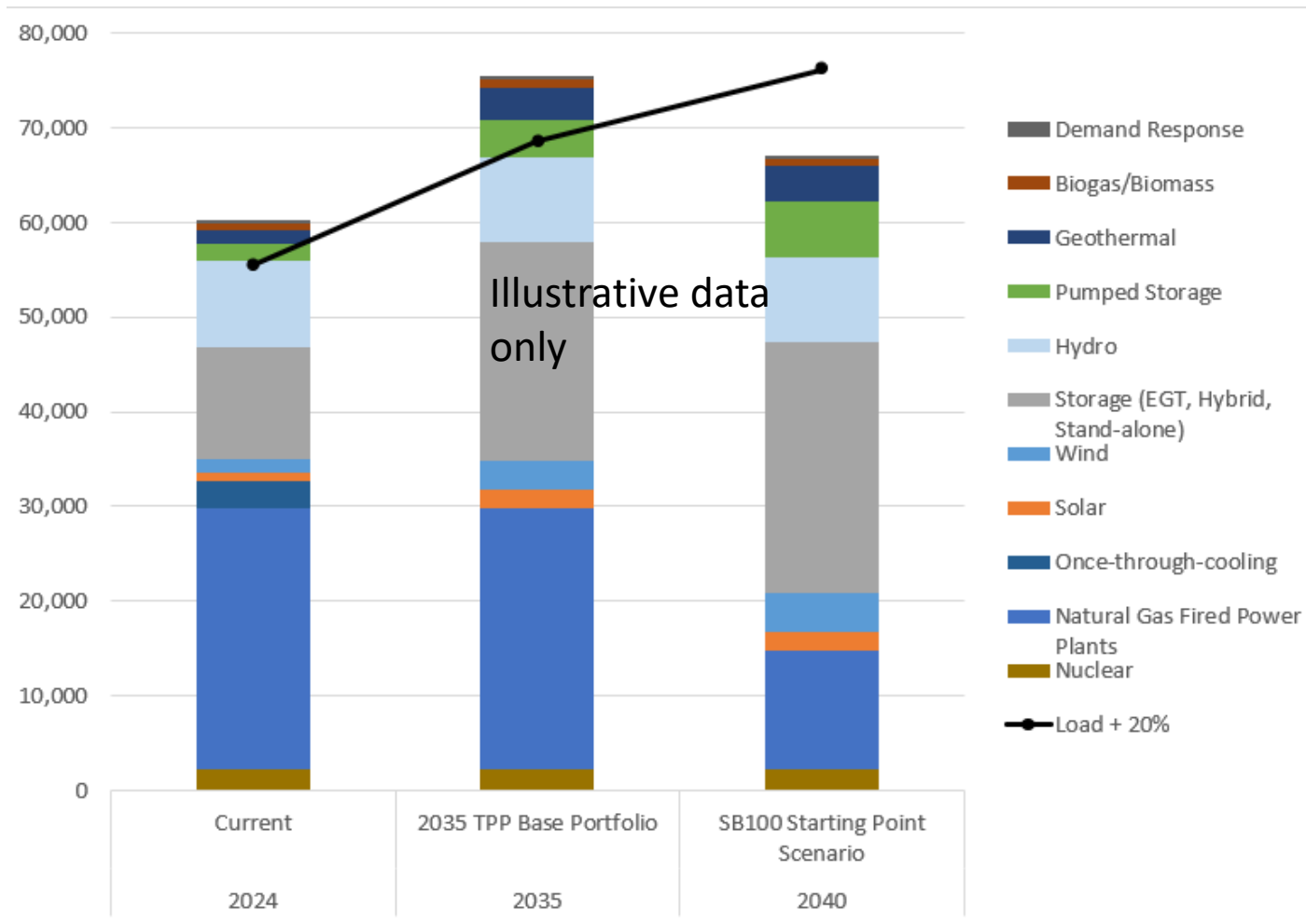
Stack analyses are insufficient for resource planning

- Next three slides show CAISO data in three different ways
 - Pmax MW from current and expected resources
 - Estimated MW available during reliability events from current and expected resources under current demand assumptions
 - Estimated MW available during reliability events from current and expected resources under high natural gas retirement and increased demand assumptions
- Without robust probabilistic analysis, the CAISO has no way of knowing whether the aggregation of all agency planning efforts is sufficient to maintain reliability or when natural gas resources can safely retire or convert their interconnection to other resource types

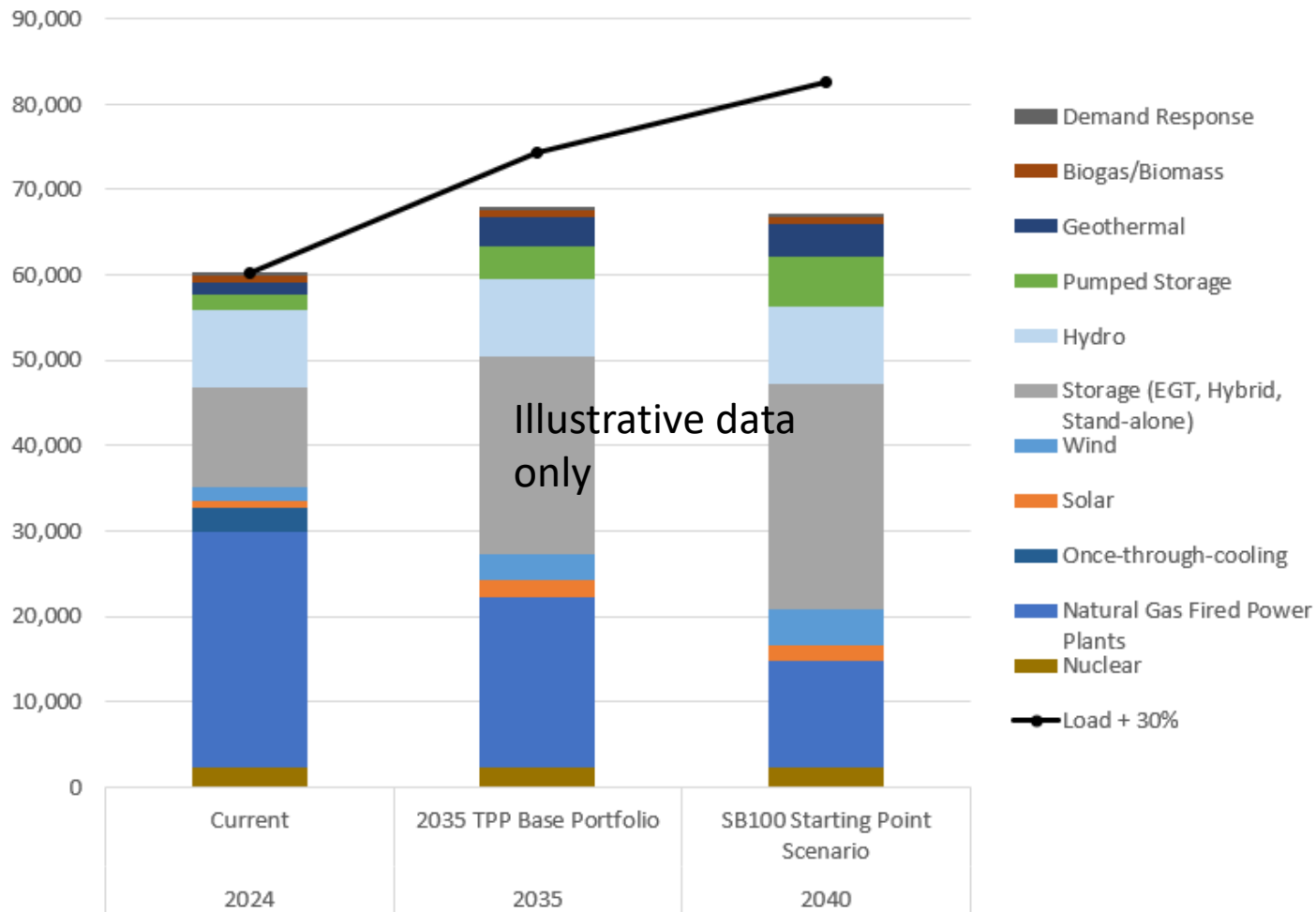
Internal supply stack using total resource output (Pmax)



Internal supply stack using an estimate of future wind, solar, storage contribution to reliability



Internal supply stack using an estimate of future wind, solar, storage contribution to reliability and high load



WPTF RA initiative priorities

1. Evaluate forward CAISO BAA reliability assessment in terms of Loss of Load Expectation and communicate the results to agencies in a useful way
2. Update default Planning Reserve Margin (PRM) and default counting rules
3. Establish a transparent and comprehensive mothball and retirement process that is based on local needs and the forward BAA LOLE assessment

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More Questions? Contact us!

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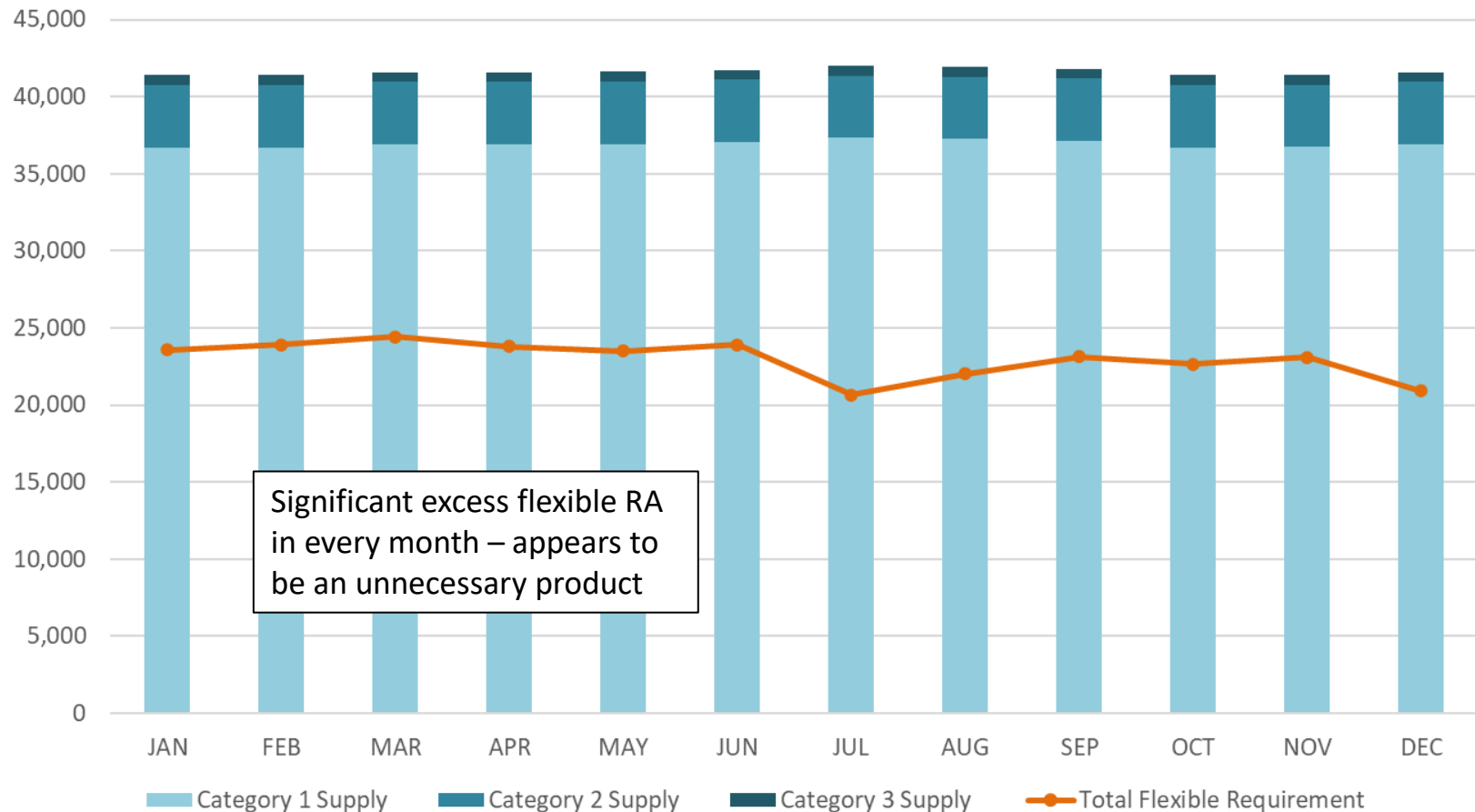
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Reminder: there are Resource Adequacy benefits of joining an ISO/RTO

- Increased efficiency
 - No need for additional transmission: the CAISO tests internal resource deliverability and has intertie rights framework for RA capacity
 - Lower transaction costs: typically, ISO/RTOs have standardized counting rules and requirements that reduce contracting and administrative costs
- Diversity benefits (*not applicable to slice-of-day*)
 - Load: LSEs will have different load shapes and peak at different times, this allows for a lower coincident peak load requirement within the ISO/RTO footprint
 - Supply: Costly for LSEs to exactly procure supply to LSE-specific load shape and meet local requirements; ISO/RTOs allow LSEs to meet system requirements with local resources and ensure aggregate system supply meets aggregate demand
- Emergency benefits
 - If one LSE experiences a rare event, it can lean on ISO/RTO market rather than continually procure additional capacity or blackout
- Energy market benefits
 - RA must-offer rule encourages additional bilateral trading in the energy market

Flexible RA Supply and Demand

2024 Flexible RA Capacity and Requirement



Significant excess flexible RA in every month – appears to be an unnecessary product