



Board Retreat: Power Procurement Overview

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Agenda

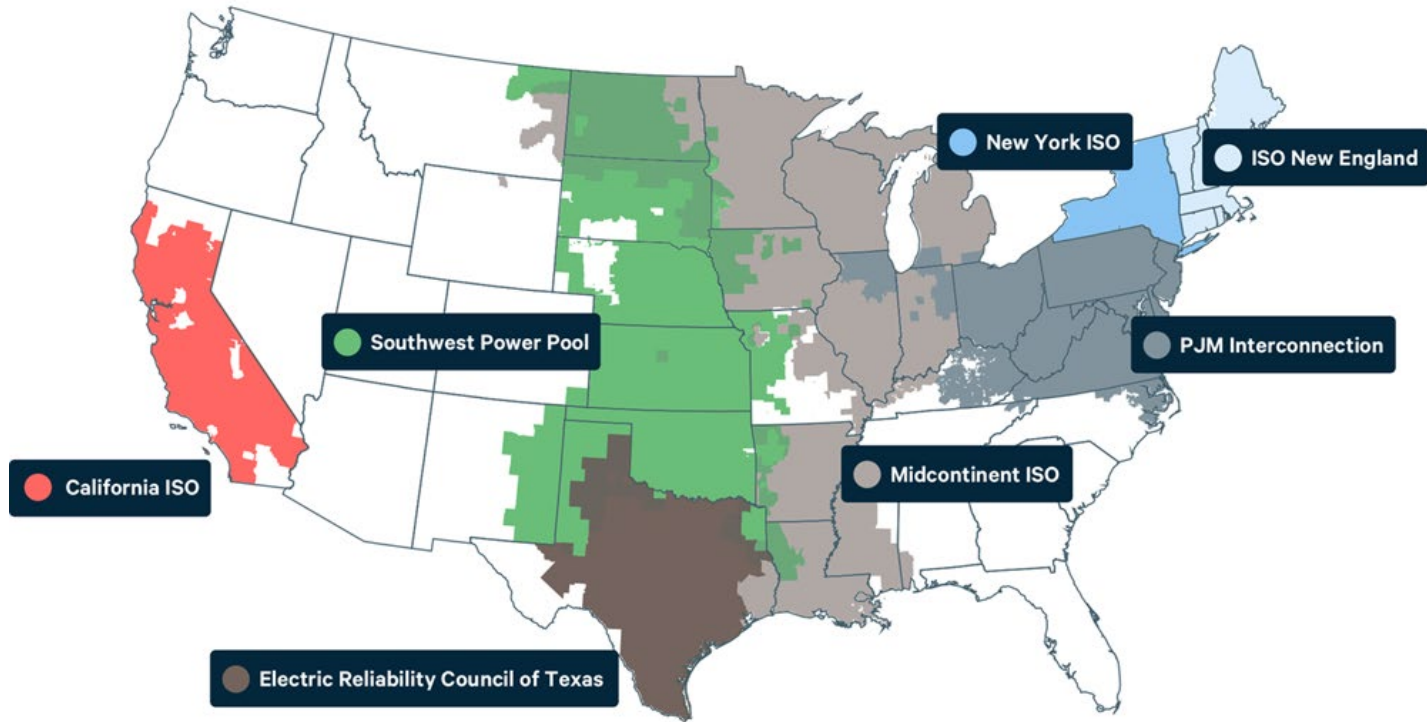
- **Section 1:** Energy Markets & RPS Overview
- **Section 2:** Integrated Resource Planning: Role & Challenges
- **Section 3:** Energy Risk Management & Business Risks
- **Section 4:** Resource Adequacy

SECTION 1:

Energy Markets & RPS Overview



North American Balancing Authority Areas



Source: Homeland Infrastructure Foundation-Level Data (2019)

California Balancing Authority Areas

CAISO BAA

- Avg. Peak Load 45,000 MW
- 26,000 circuit miles of transmission

Role of CAISO

- Competitive Wholesale Power Market
- Reliable Operations
- Grid Planning and Development



Wholesale Energy Market Products

- **Energy**
- **Transmission**
- **Capacity**
 - Resource Adequacy
 - Ancillary Services
 - Operating Reserves
 - Regulation Services
- **Natural Gas**
- **Congestion Revenue Rights**
- **Renewable Energy Products**



CAISO Markets

Day-Ahead Market

- Matching Supply / Demand
- Majority of Transactions
- Market Processes

Real-Time Market

- Matching Supply / Demand
- Incremental Adjustments to DAM
- 15-Min. and 5 Min. settlements
- Market Processes



CAISO Nodal Pricing Settlement

Load and Supply Nodal Settlement

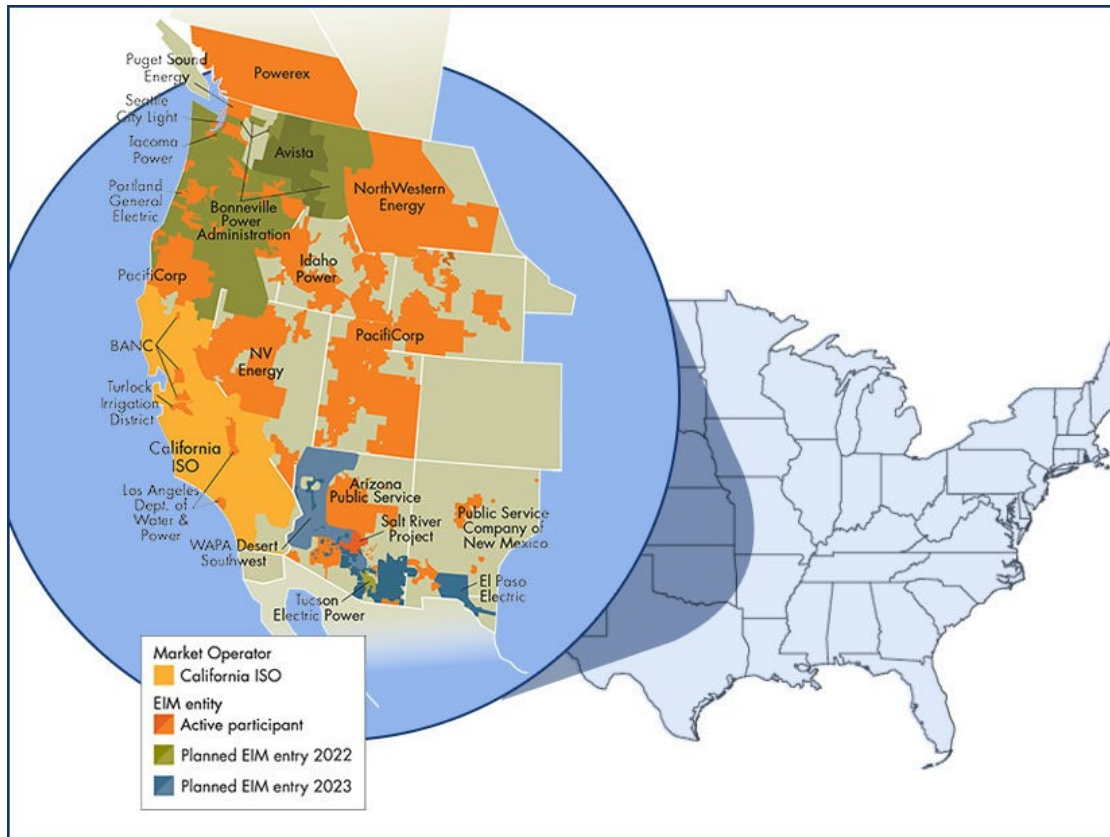
- Load Settlement at DLAP
 - Default Load Aggregation Point
 - EBCE in PG&E DLAP
- Generation Settlement
 - Individual PNODE
 - Pricing at location of generation
- Inter-SC Trades
 - Trading Hub Settlement
 - NP15 EZ GEN HUB
 - Weighted average of generation PNODs



CAISO EIM – Energy Imbalance Market

Primary Goals

- Enhance reliability
- Generate cost savings
- Improve integration of renewables
- Tap into locational specific resources
- Reduce price variability



Regulatory Bodies

CAISO

- **California Independent System Operator**
 - Manages the flow of electricity on high-voltage power lines, operates a wholesale energy market, and oversees infrastructure planning.

FERC

- **Federal Energy Regulatory Commission**
 - United States federal agency that regulates the transmission and wholesale sale of electricity and natural gas in interstate commerce.

NERC

- **North American Electric Reliability Corporation**
 - Nonprofit corporation created by the electric utility industry to promote the reliability and adequacy of bulk power transmission in the electric utility systems of North America.

CPUC

- **California Public Utilities Commission**
 - Regulatory agency that regulates privately owned public utilities in the state of California, including electric power, telecommunications, natural gas and water companies.

CEC

- **California Energy Commission**
 - As the state's primary policy and planning agency, the Energy Commission is committed to reducing energy costs and environmental impacts of energy use while ensuring a safe, resilient, and reliable supply of energy.

Compliance with the Renewable Portfolio Standard (RPS)

What is RPS?

- Key program for advancing renewable energy
- Sets escalating renewable energy procurement requirements for CA Load-Serving Entities
- Must be procured from RPS eligible facilities
- Targets verified on multi-year period rather than annually

CP#	CP3		CP4				CP5			CP6		
Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
RPS %	31%	33%	36%	39%	41%	44%	47%	49%	52%	55%	57%	60%

Portfolio Content Category (PCC) Classifications and Renewable Energy Credits (RECs)

RECs:

- Represent clean energy attributes of renewable electricity
- Each REC is equivalent one MWh of renewable electricity generated
- Limitations to the amount that each group can count towards RPS requirements

Classified into three distinct categories

PCC 1	Energy and REC are from same source and delivered into a California Balancing Authority (CBA) without any substitution
PCC 2	Substitute Energy not from the same source as REC
PCC 3	Electricity Products Not Qualified as PCC 1 or PCC 2, Including Unbundled RECs

Compliance with the Renewable Portfolio Standard (RPS)

RPS Compliance

- Multi-year compliance periods with annual reporting requirements
- Minimum required percent of electricity from designated renewable energy resources

vs.

Power Content

- Annual requirement, for 1 calendar year of purchases
- Detailed breakdown on sources of energy used to provide electricity
- Resembles a nutrition label

SECTION 2:

Integrated Resource Planning & its Impact



What is the Integrated Resource Plan (IRP)?

California statute requires all load-serving entities to prepare IRPs

- Each CCA, as well as each IOU and ESP, is required to file its IRP with the CPUC on a biennial basis (2-year cycle)
- First year of cycle: CPUC develops a Reference System Portfolio (RSP) – used in the CAISO Transmission Planning Process and in load serving entity IRPs
- Second year of cycle: LSEs file IRPs at the CPUC; CPUC aggregates, evaluates, and uses IRPs to form a recommended Preferred System Portfolio (PSP). Can also result in procurement mandates

First IRPs were due in 2018; second were 2020, next: ~November, 2022. Takeaways from previous studies:

- Initial IRPs were developed as individual plans but with no understanding of the collective impact of plans
- By planning jointly, CCAs can understand where their reliance on resources in their plan is duplicative **or** if their plans fail to adequately support grid reliability
- Additional detailed modeling may supplement the information developed by the CPUC

IRP – Project Objectives

Questions we seek to answer:

- What is the ideal mix of resources to achieve both the state’s and EBCE’s own goals?
- What resources will most cost effectively contribute to grid reliability?
- Recognizing EBCE’s plan to achieve an emission-free portfolio by 2030, what would the impact be of attempting to achieve the portfolio on a time-coincident basis

Create an Integrated Resource Plan (IRP) reference portfolio that will:

- Conform with the CPUC reference case
- Meet CPUC required inputs and regulations
- Achieve additional EBCE priorities and goals

Potentially develop a second preferred portfolio to achieve EBCE’s objectives while managing risk and cost

IRP – Goals for 2022 IRP

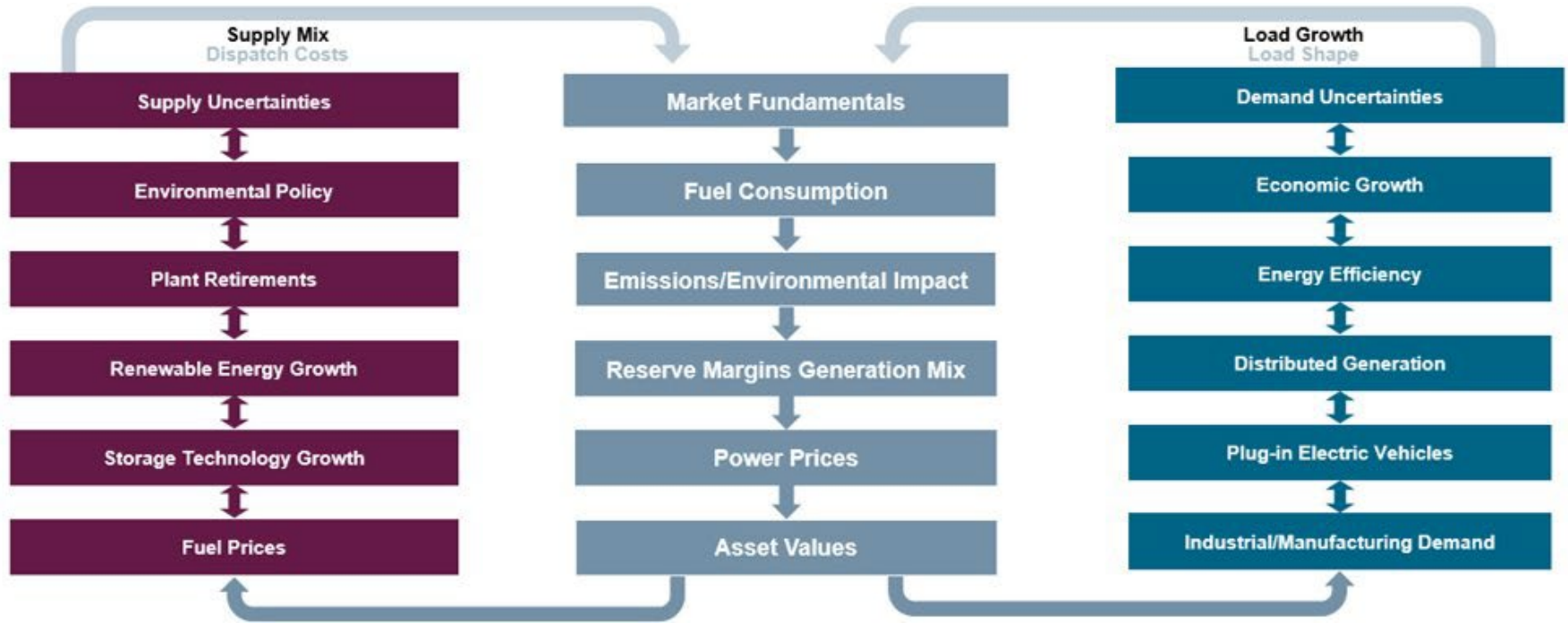
- 1) Identify cost-effective, feasible, reliable, equitable and robust options to achieve our communities' goals and objectives, and to reduce carbon emissions
- 2) Inform and engage stakeholders in the IRP process
- 3) Allow the IRP process to inform the selection of a preferred portfolio
- 4) Use one model for consistency in optimization, simulated dispatch, and probabilistic functions
- 5) Test a range of portfolios in scenario modeling and ultimately in risk analysis
- 6) Meet CPUC requirements
- 7) Timely obtain necessary Board approvals

IRP – Objectives & Measures

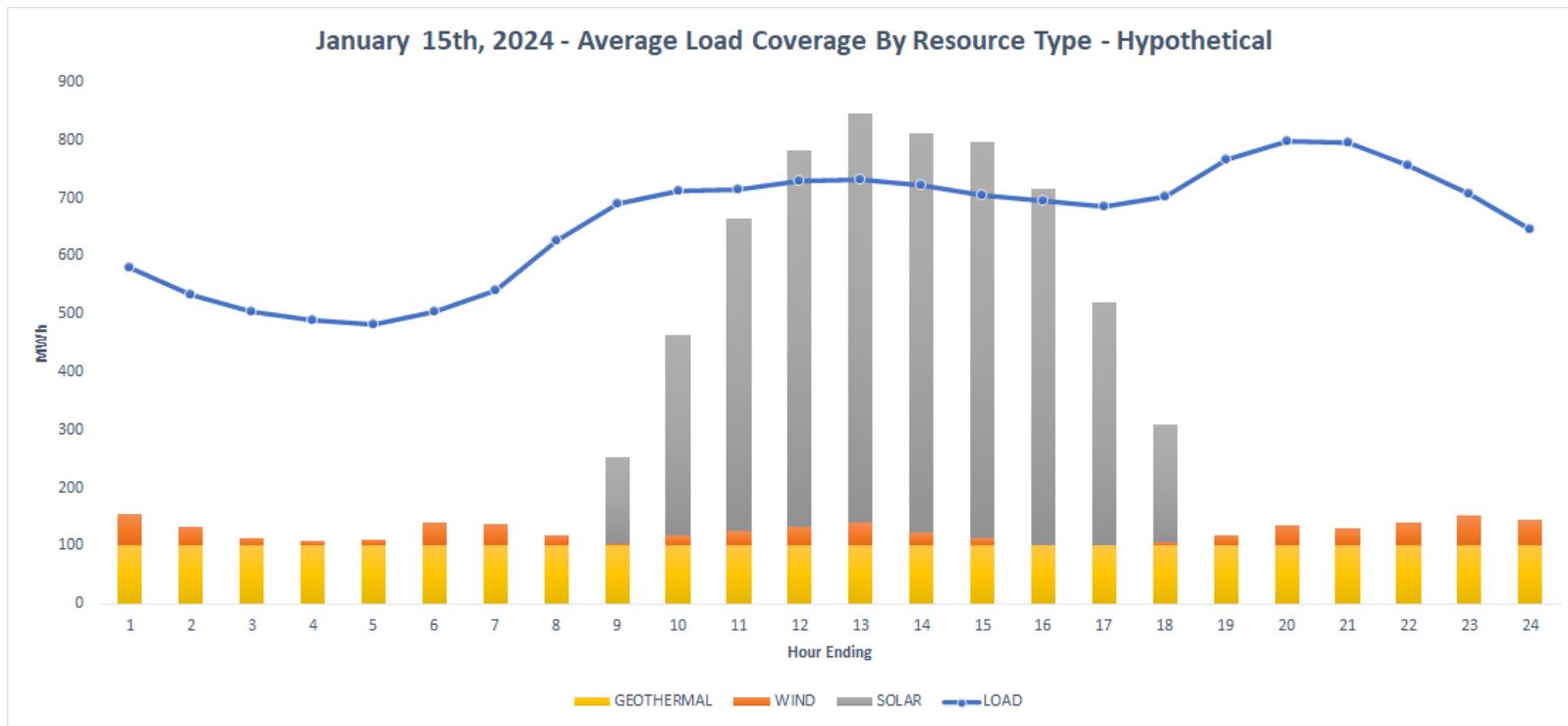
- Purpose of the IRP is to evaluate CCAs' current energy resource portfolio & a range of alternative future portfolios to meet customers' electrical energy needs in an affordable, system-wide manner that also takes into account
- Each objective is important & worthy of balanced consideration in the IRP process; taking into account uncertainty, some objectives are better captured in portfolio construction than as a portfolio measure
- The measures allow the analysis to compare portfolio performance and potential risk on an equal basis

	IRP Objectives
	Affordability
	Meeting GHG Emissions Reduction Targets
	System Reliability
	Resource Diversity

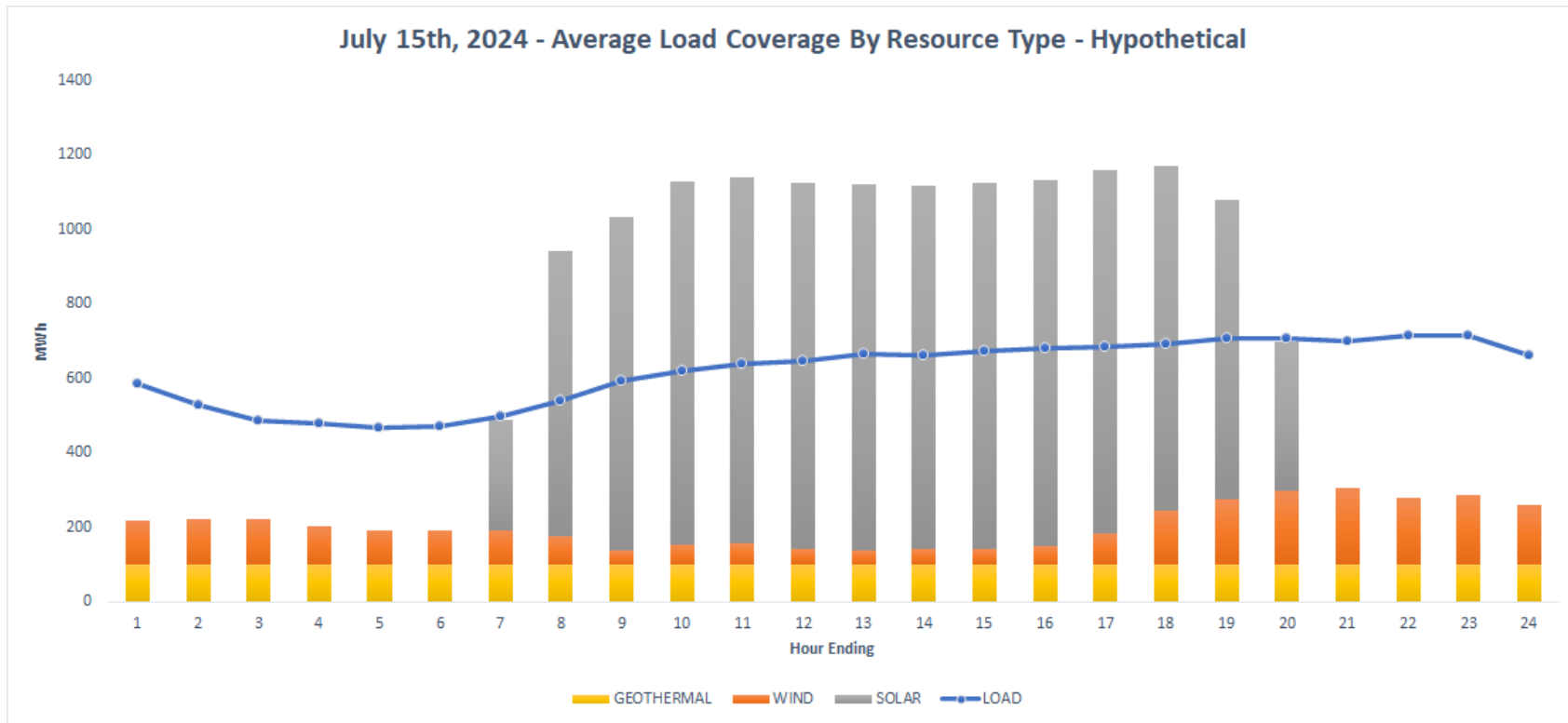
IRP – Key Market Drivers



Hypothetical Future January

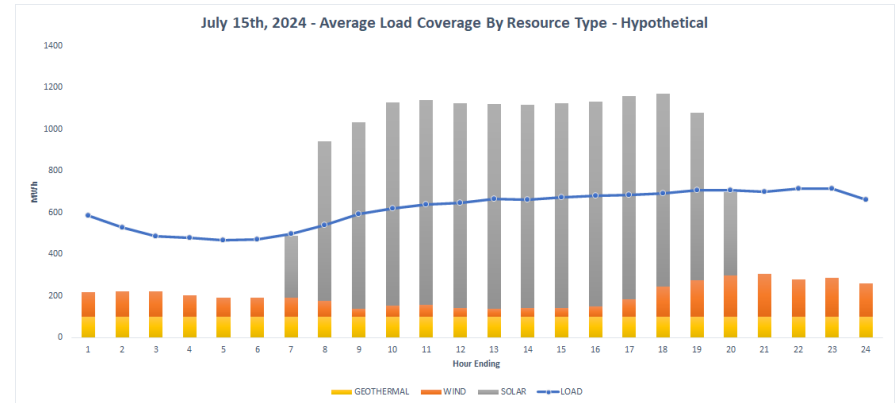
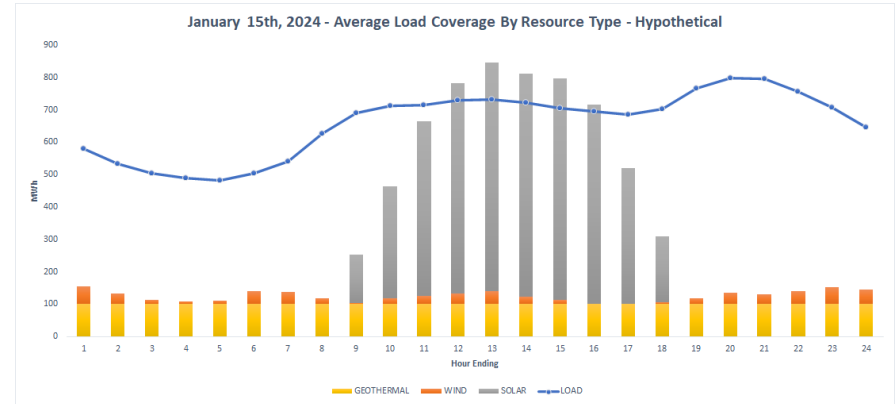


Hypothetical Future July



Step 1: Needs Assessment

- Demand forecast
 - Peak vs average monthly loads
- Quantity Compliance Requirements
 - RPS
 - RA
- Other EBCE-goals
- Market Dynamics
 - Open position
 - Market price exposure
- Risk Management
 - Hedge strategies
 - Financeability of transactions



Step 2: Prioritization & Valuation

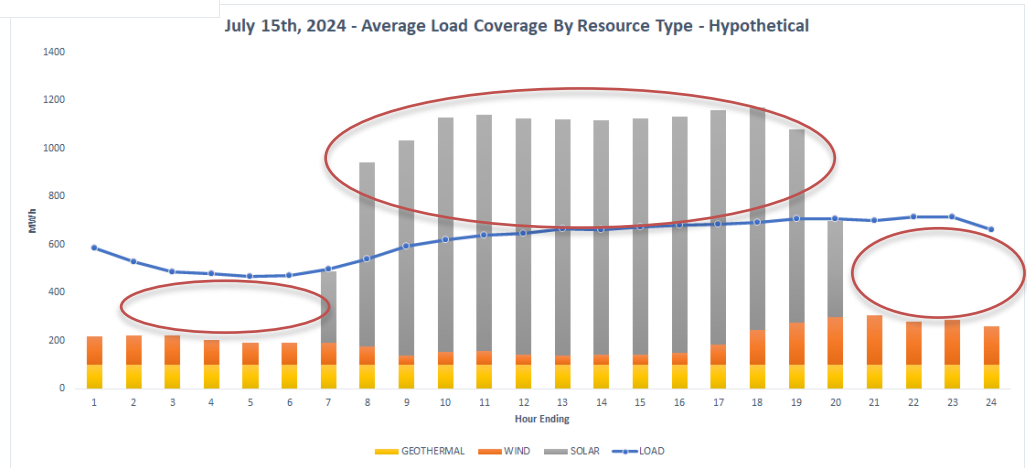
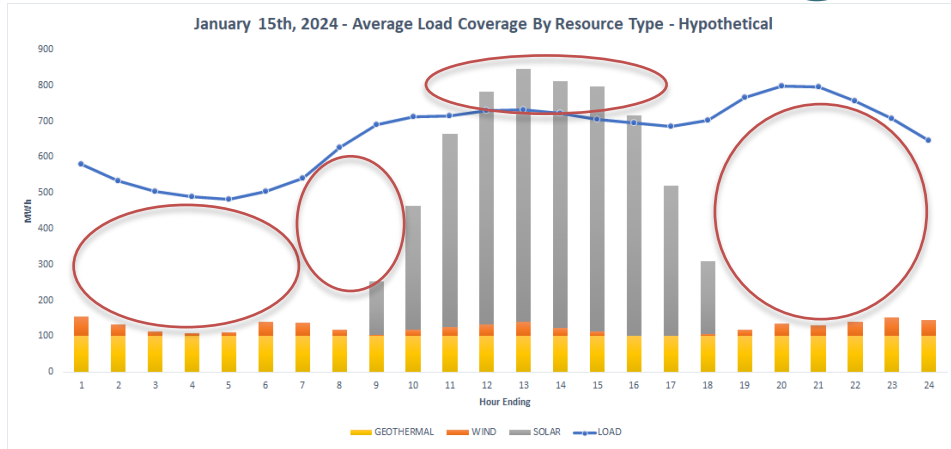
Prioritization

- Compliance Requirements
 - RPS
 - RA
- Market Dynamics
 - Open position
 - Market price exposure
- Risk Management
 - Hedge strategies
 - Finance-ability of transactions
- Other EBCE goals

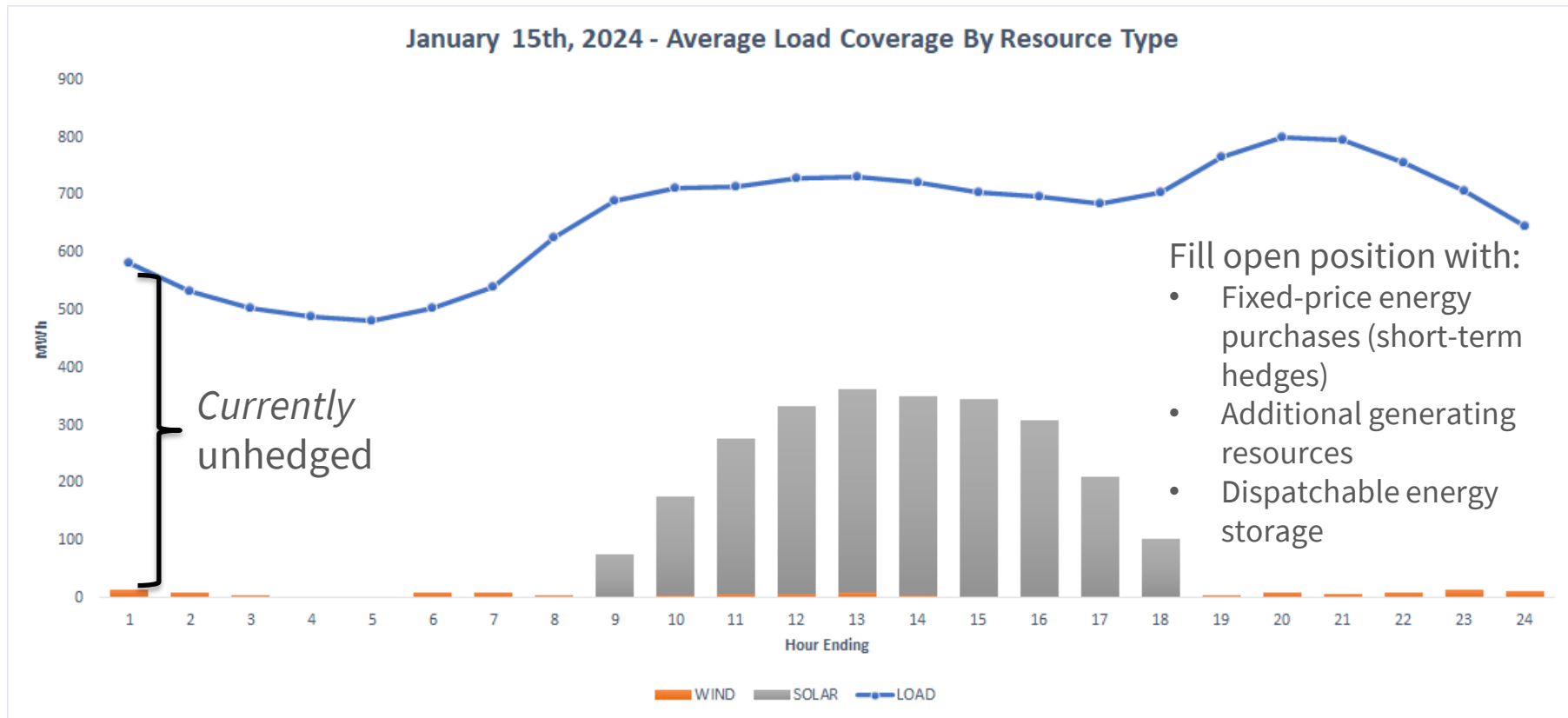
Valuation

- Quantitative Inputs
 - Forward Curve Development (Energy, RA, RPS)
 - Estimated Value of Location
 - Others
- Qualitative Inputs
 - Open position risk (+ or -)
 - Credit terms & seller creditworthiness
 - Counterparty concentration
 - Project risk/ability to construct in a timely manner
 - Environmental considerations

Step 3: Define Eligible Products

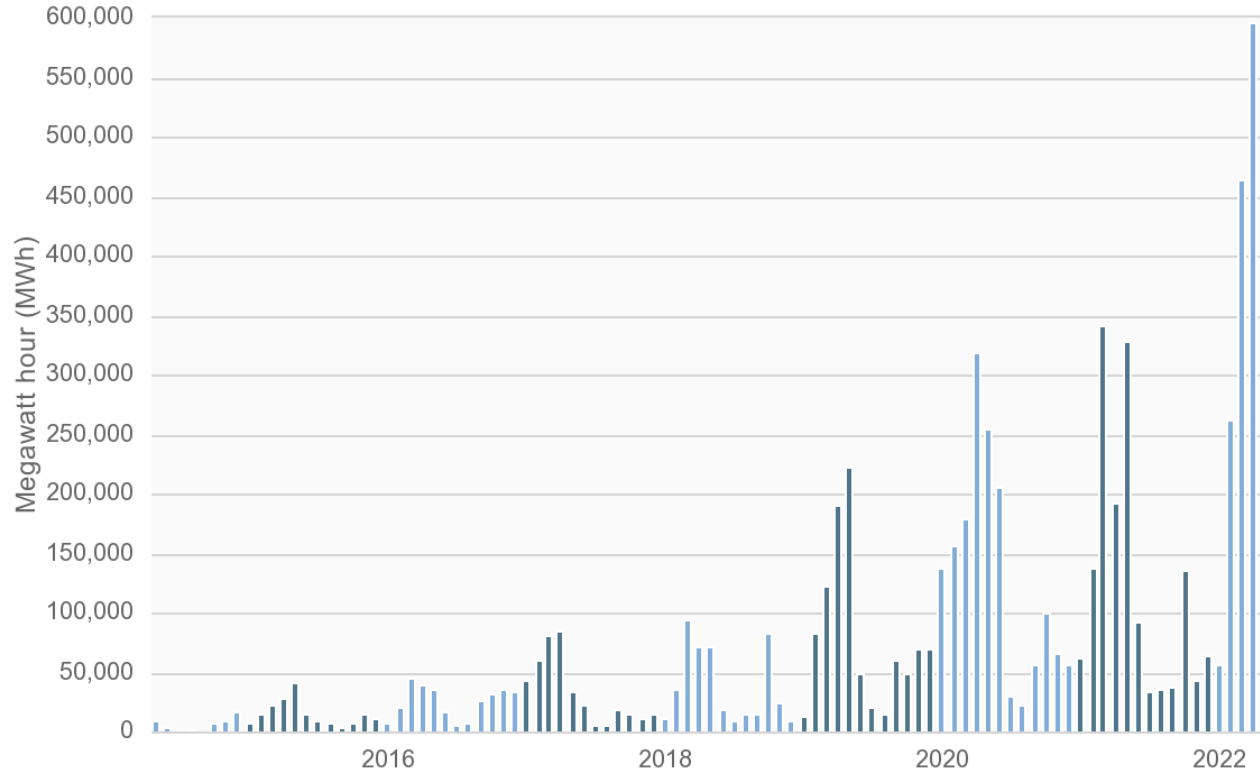


Example: “un-hedged” January, 2024



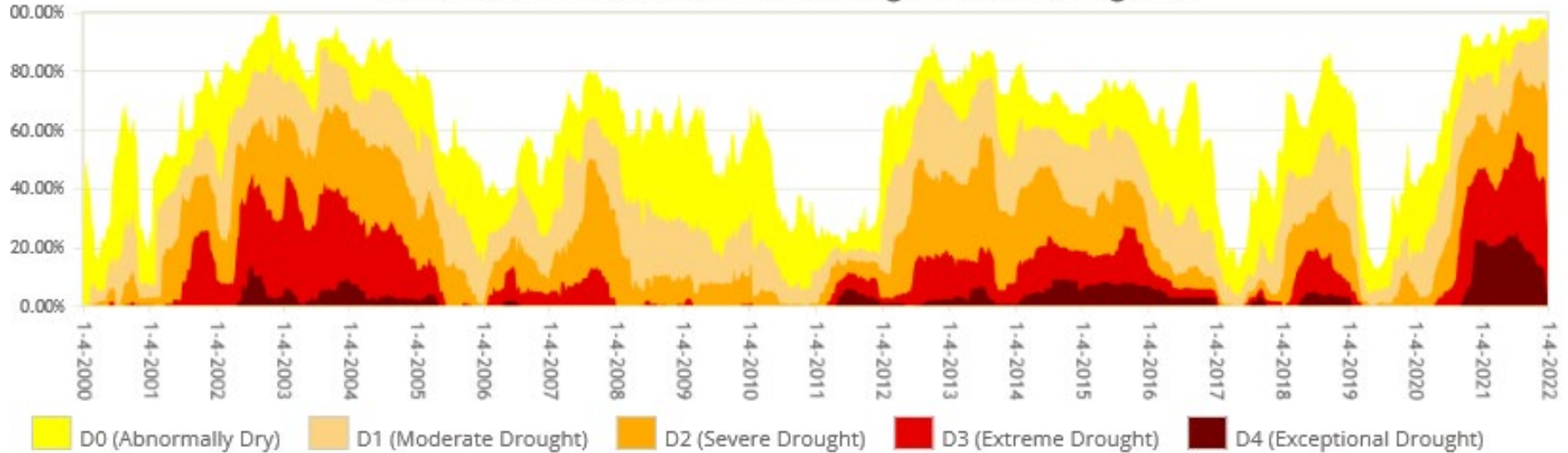
CAISO Wide Curtailment

Wind and solar curtailment totals by month



Climate Driven Drought

Western U.S. Percent Area in U.S. Drought Monitor Categories



Step 4: Go-to-Market

- Identify Product
- Develop Timeline
- Market/Seller Outreach
- Evaluate Offers
- Negotiate
- Calculate final, proposed notional values
- Execute Agreements

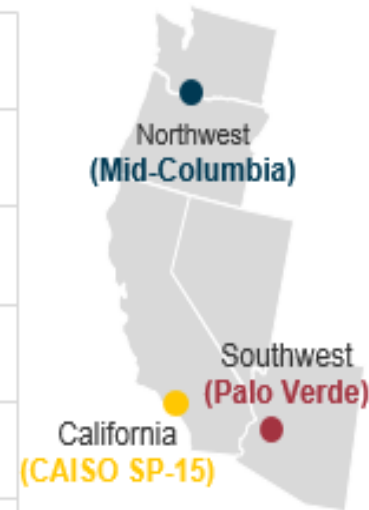
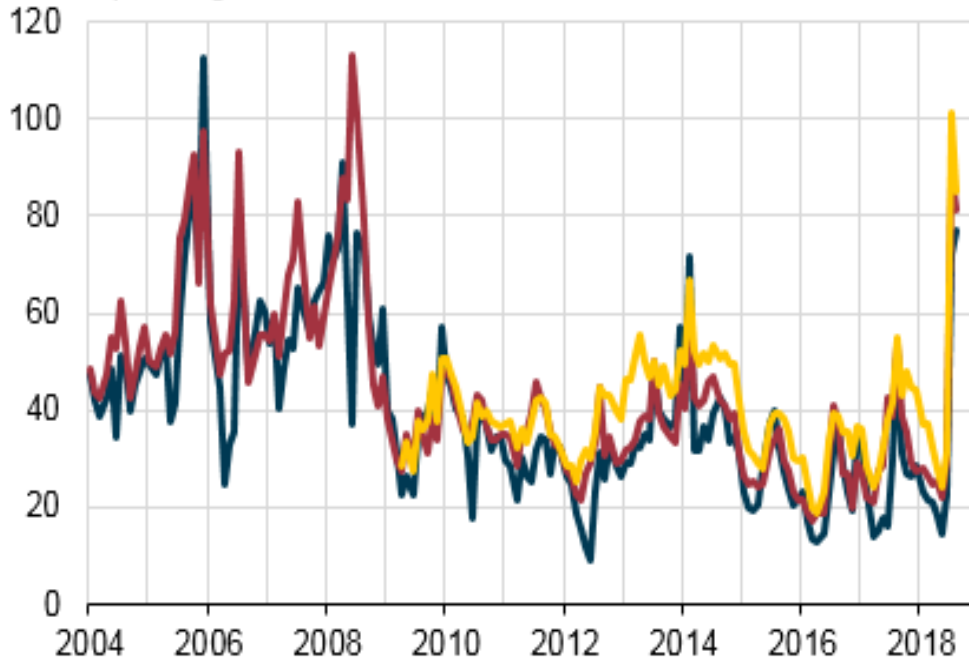
SECTION 3:

Energy Risk Management



Energy Price Volatility

Monthly average U.S. peak wholesale electricity prices at selected hubs
dollars per megawatthour



Energy Risk Management

Key Energy Market Risks

- Volumetric Risk
 - Fluctuations in the volume of supply and demand
- Price Risk
 - Price volatility

Risk Management Objectives

- Mitigate Exposure to Volatility
- Durable Rates
- Financial Stability
- Regulatory Compliance (FERC & CFTC)



Risk Oversight Committee

- Energy Risk Management Policy approved by the Board
- Energy Risk Management Procedures approved by the Risk Oversight Committee
 - Approved trading counterparties
 - Approved trading products/instruments
 - Approved personnel
 - Approved authorities
 - Compliance training
 - Exception reporting

Hedge Strategy guided by price distribution

Long-Term Hedging

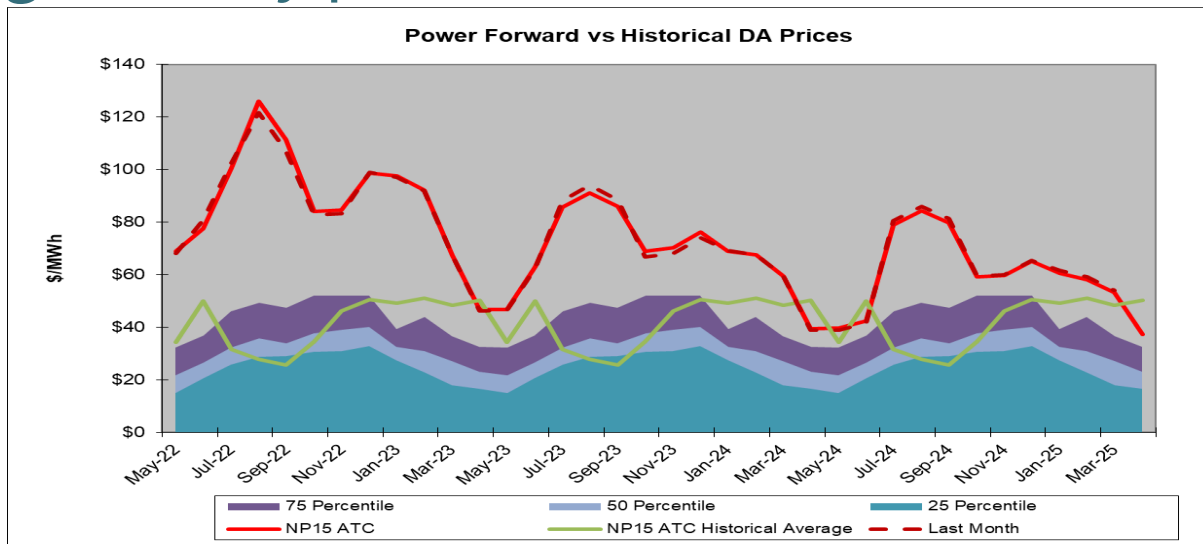
- Load Forecasting
- Coverage Objectives
- Market Conditions
- Resource Composition

Short-Term Hedging

- Refined Load Forecast
- Intra-Month / Intra-Day Shaping
- Market Conditions

Fixed-Price Energy Hedging

- Inter-SC Trades



Example:

Months to Delivery		Price Matrix Percentile						
		>60%	60%	50%	40%	25%	10%	<10%
		Covered Position as a % of Forecasted Load						
0+	3	80%	80%	85%	85%	90%	90%	100%
3+	6	70%	70%	75%	80%	80%	90%	100%
6+	9	70%	70%	75%	80%	80%	80%	90%
9+	12	60%	60%	70%	80%	80%	80%	90%
12+		60%	60%	70%	80%	80%	80%	90%

Counterparty Credit Risk Management

- Evaluate and monitor CP credit worthiness
- Assess CP Mark to Market exposure
- Mitigate CP credit risk through collateral

SECTION 4:

Resource Adequacy



Resource Adequacy

Resource Adequacy (RA):

- A compliance product to ensure there is adequate capacity to match customer demand with available generation at any hour of the day in the CAISO
- Resource Adequacy is purchased as available capacity,

Requirements:

- EBCE is required to procure an amount of capacity that is determined from the peak customer demand by month + 15%
- The RA requirement is defined annually, and is impacted by customer load growth and retiring resources
- LSEs must demonstrate compliance to both the CPUC and CAISO, annually and monthly

Resource Adequacy - Types

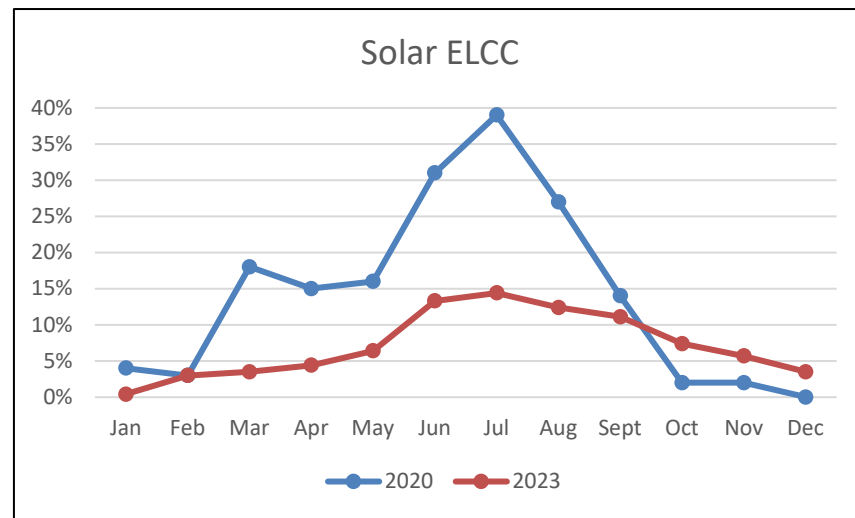
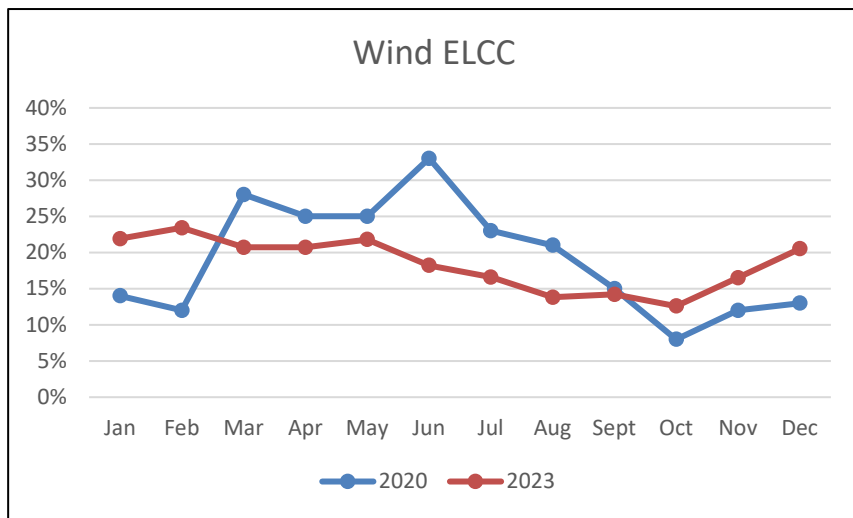
- CPUC Jurisdictional LSEs (EBCE) have 3 types of RA requirements: System, Local and Flexible

System	Local*	Flexible
<ul style="list-style-type: none">• Interconnected to CAISO• Imports<ul style="list-style-type: none">○ Energy imported from outside the CAISO	<ul style="list-style-type: none">• EBCE has a Local capacity requirement• Local areas have limited import capability (transmission constraints) with local reliability problems	<ul style="list-style-type: none">• Determined by resource ability to dispatch energy during hours of “flexible need”• Both System and Local can be flexible

***Central Procurement Entity (CPE):** EBCE is responsible for Local RA in 2022 and years prior. Starting in 2023 Local RA will be purchased by the CPE.

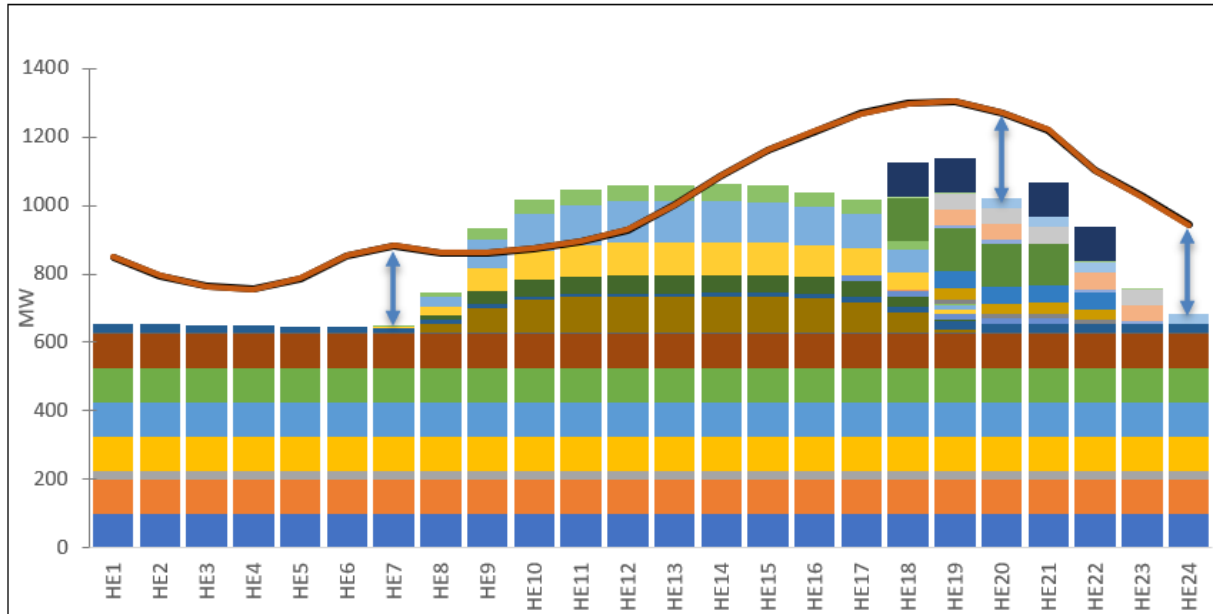
Resource Adequacy - Renewables

- ELCC (Effective Load Carrying Capability) is used to determine the contribution of intermittent resources to system reliability.
- Solar and wind offer diminishing contributions to RA as penetration grows, particularly for solar, which was already facing low ELCC.
- Dramatic decrease in Solar ELCC in summer months will contribute to a more constrained RA market in summer.



RA Reform & Slice of Day

- Intent of RA Reform: Minimize customer cost, meet hourly reliability needs, be adaptable to a changing grid.
- Full implementation starts with compliance year 2025.
- Under SOD, RA obligations based on EBCE's hourly share of CAISO load for the "worst day" of each month.
- Chart below is an example showing.



RA – Reliability Procurement Mandates

- Two procurement orders: Near-Term Reliability (2021-23) and Mid-Term Reliability (2023-26)
- Incremental capacity to be procured from resources such as solar, wind, storage, hybrid, geothermal, demand response.

	Near-Term Reliability	Mid-Term Reliability
Compliance Term	2021-2023	2023-26
EBCE Requirement (across Compliance Term)	99.6 MW	418 MW
Resource Counting	RA framework	Incremental ELCC's (e.g. solar counts for 6.6% for 2024, and 4-hr Batteries count for 90.7% for 2024)
Penalty	none	Cost of New Entry

QUESTIONS & DISCUSSION

