



Board Retreat: Power Procurement Overview

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Agenda

- **Section 1:** Energy Markets Overview
- **Section 2:** Overview of Transacted Products & Key Compliance Rules
- **Section 3:** How Do We Build a (RPS) Portfolio?
- **Section 4:** Energy Risk Management & Business Risks

SECTION 1:

Energy Markets Overview

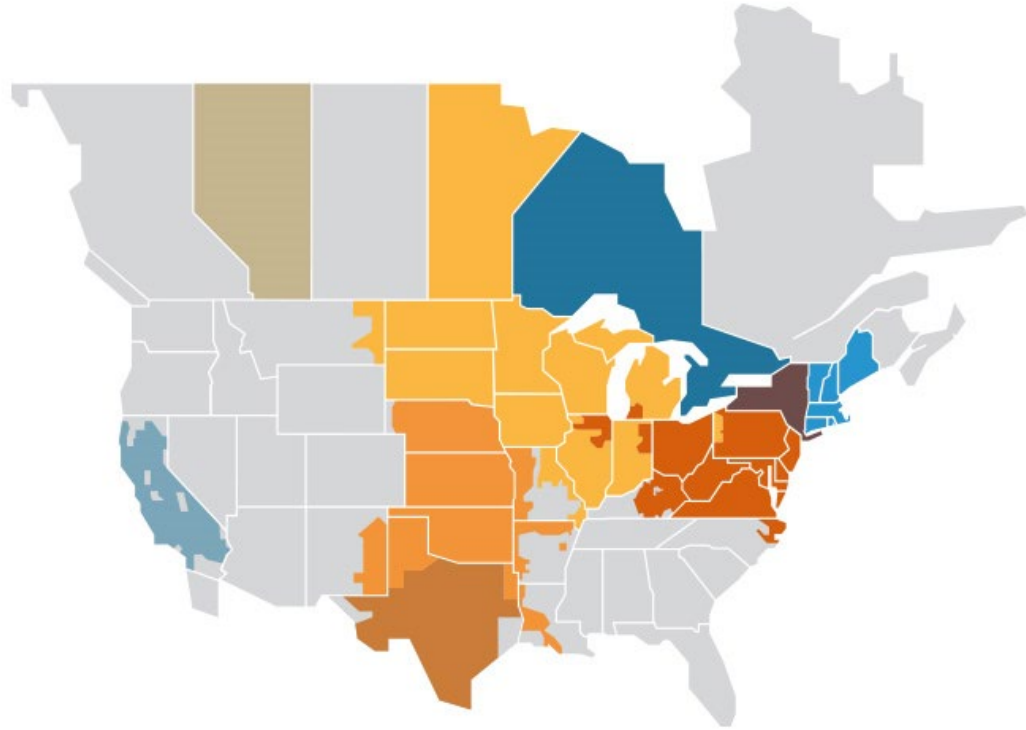


North American Balancing Authority Areas

There Are Nine ISOs and RTOs in North America

ISO New England covers the six states of Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont.

- California ISO
- Alberta Electric System Operator
- Electricity Reliability Council of Texas
- Southwest Power Pool
- Midcontinent ISO
- Ontario Independent Electricity System Operator
- PJM Interconnection
- New York ISO
- ISO New England



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**



Energy Market Price Volatility

Key Drivers of Energy Market Prices:

- Weather
 - Local and Regional
- Intermittent Non-Dispatchable Resource Production
 - Solar
 - Wind
 - Lack of Battery Storage
- Hydrology
- Natural Gas
 - Storage
 - Transport
 - Demand
- Policy and Changing Supply Composition
 - RPS
 - GHG Free Objectives



CAISO Markets

Day-Ahead Market

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

Real-Time Market

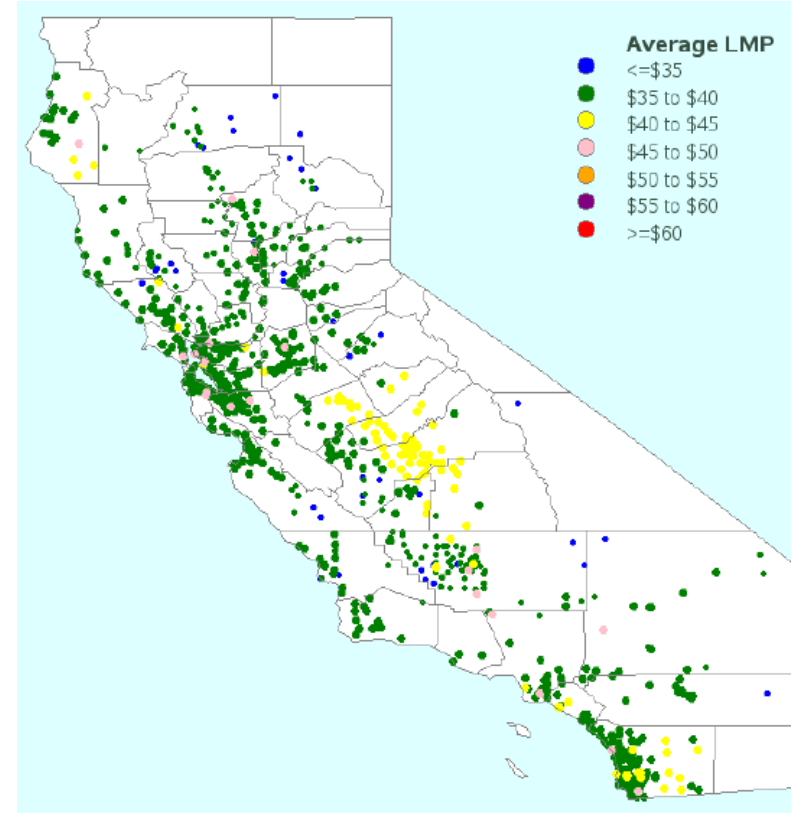
- Matching Supply / Demand
- Incremental Adjustments to DAM
- 15-Min. and 5 Min. settlements
- Market Processes



CAISO Nodal Pricing

Locational Market Prices (LMP)

- Full Network Model
- Prices Calculated at each Node
 - Load
 - Generation
 - Inter-Tie
- Price Granularity
 - Hourly, 15-Min. and 5-Min.
- Based on Cost of Serving 1 MW of Incremental Load



CAISO Nodal Pricing Settlement

Load and Supply Nodal Settlement

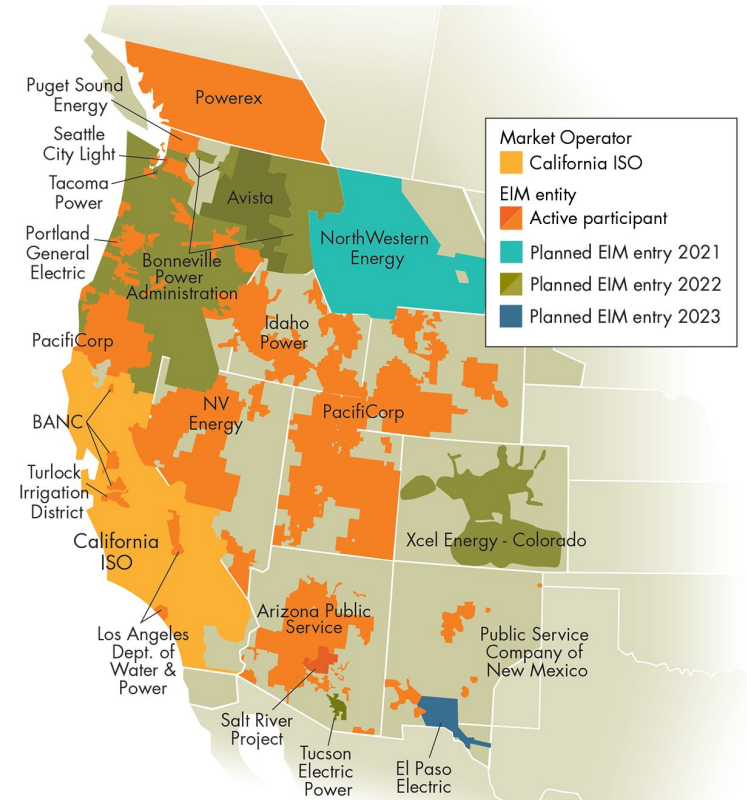
- Load Settlement at DLAP
 - Default Load Aggregation Point
 - EBCE in PG&E DLAP
- Generation Settlement
 - Individual PNOD
 - Pricing at location of generation
- Inter-SC Trades
 - Trading Hub Settlement
 - NP15 EZ GEN HUB
 - Weighted average of generation PNODs



CAISO EIM – Energy Imbalance Market

Primary Goals

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



Map boundaries are approximate and for illustrative purposes only.

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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.

SECTION 2:

Transacted Products & Compliance Reporting Requirements



Three Primary Products

Fixed Price Energy Hedges

Resource Adequacy

Renewable Energy (& Carbon-Free)

+ Reporting Requirements

Fixed Price Energy Hedges

Fixed Price Hedge Overview

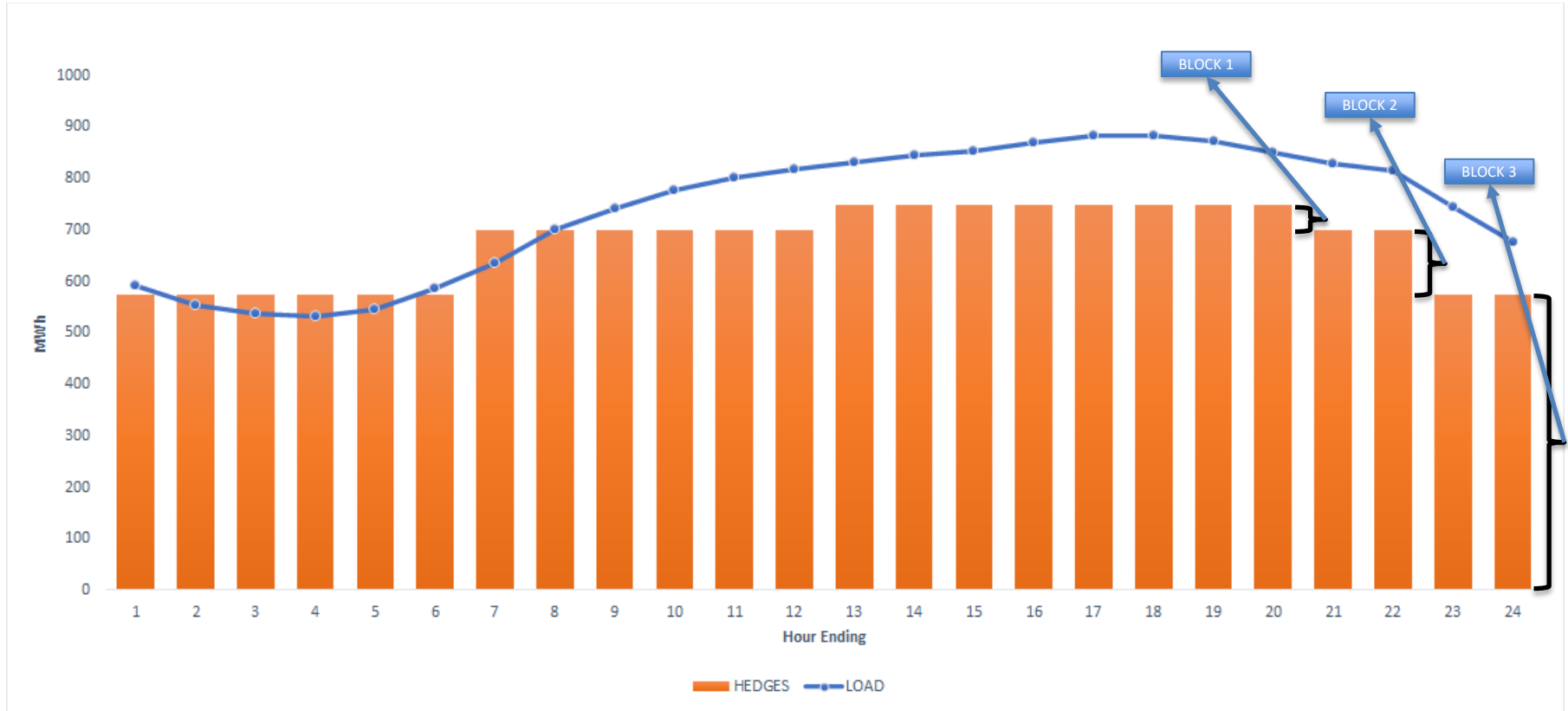
Fixed Volume:

- Energy is contracted to have a fixed volume over the tenure of the transaction
- Volumes typical vary by peak period, and can be shaped across the day

Fixed Price:

- Energy is contracted to have a fixed price over the tenure of the transaction
- Prices typical vary by month or year

Fixed Price Energy Hedges



Resource Adequacy

Resource Adequacy

Resource Adequacy (RA):

- A product for ensuring there is adequate capacity for matching customer demand with available generation at any hour of the day in the CAISO
- Resource Adequacy is purchased as available capacity, if called upon by the CAISO, a generation resource has energy that can be turned on, dispatched onto the grid

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• Demand Response, Demand Reduction	<ul style="list-style-type: none">• EBCE has a Local capacity requirement based on customer demand, and location• Local requirement is in sub-areas of PG&E's Transmission Area (TAC)	<ul style="list-style-type: none">• Requirement for flexible capacity• Determined by resources ability to dispatch energy in a certain time frame and frequency• Both System and Local can be flexible

***Central Procurement Entity (CPE):** EBCE will procure local capacity for 2021 and 2022, starting in 2023 Local Capacity will be purchased by the CPE

Renewable Portfolio Standard (RPS)

Renewable Portfolio Standard: Definitions

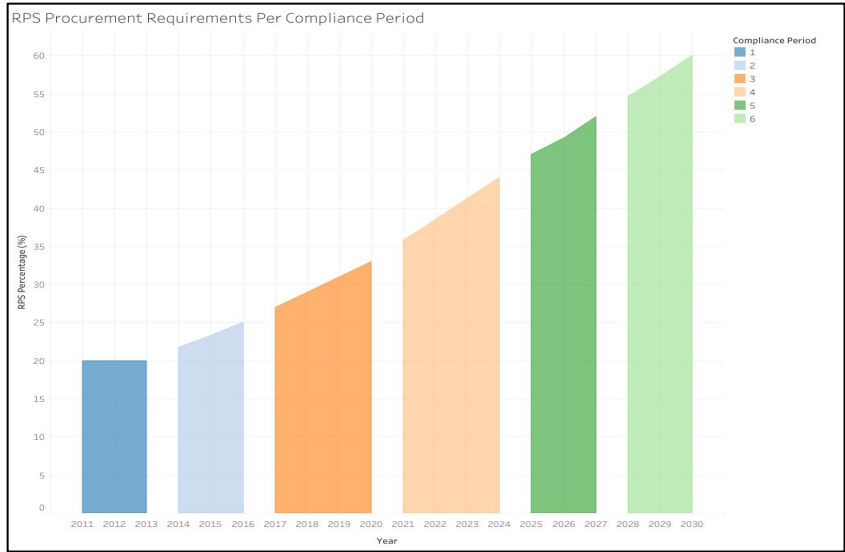
- **Renewable Portfolio Standard (RPS)**: sets goals for Load Serving Entities (LSE) to increase the amount of renewable energy procured annually until 60% of sales are from eligible renewable energy resources by the end of 2030
- **Renewable Energy Credit (REC)**: a certificate of proof associated with the generation of electricity from eligible renewable energy resources, 1 REC = 1 MWh of renewable generation

REC Categories:

- **Portfolio Content Category (PCC) 1 REC**: the electricity and the REC are from the same eligible renewable resource and delivered into a California Balancing Authority (CBA) at the same time
 - This can be transacted under a fixed price contract or as an indexed transaction
- **PCC 2 REC**: the electricity and the REC are from different sources but matched and delivered into a CBA at the same time
- **PCC 3 REC**: there is no associated electricity, just the unbundled REC, EBCE limits PCC3 procurement to a maximum of 5% of Bright Choice renewables procurement

Renewable Portfolio Standard: Rules

- Over a Compliance Period (CP), LSEs must have a certain percent of their purchases from eligible renewable resources
- There is no single year requirement; at the end of each CP, LSEs must have purchased the **average percent** as eligible renewable content across that CP
- SB 350 requires that 65% of eligible renewable purchases come from contracts **10 years or longer** starting in 2021
- Non-compliance with the RPS could result in a \$50/MWh fine for any shortage



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%

Power Content Label

Power Content Label

- CA state reporting requirement, discloses the electricity that was delivered to customers as a percent by energy resource for a given calendar year
- Requires EBCE and other electricity retail sellers to declare the electricity by generation source, that was purchased during a calendar year
- Uses a different methodology than the Renewable Portfolio Standard (RPS)
- Emissions from 2020 purchases will be disclosed on the 2021 Power Content Label

Energy Resources	Renewable 100	Brilliant 100	Bright Choice	2019 CA Power Mix
Eligible Renewable¹	100.0%	75.0%	59.9%	31.7%
Biomass & Biowaste	0.0%	0.0%	3.6%	2.4%
Geothermal	0.0%	0.0%	12.3%	4.8%
Eligible Hydroelectric	0.0%	0.0%	4.9%	2.0%
Solar	50.0%	37.5%	3.5%	12.3%
Wind	50.0%	37.5%	35.7%	10.2%
Coal	0.0%	0.0%	0.0%	3.0%
Large Hydroelectric	0.0%	25.0%	25.3%	14.6%
Natural Gas	0.0%	0.0%	0.1%	34.2%
Nuclear	0.0%	0.0%	1.5%	9.0%
Other	0.0%	0.0%	0.2%	0.2%
Unspecified sources of power²	0.0%	0.0%	13.1%	7.3%
TOTAL	100%	100%	100%	100%
Percentage of Retail Sales Covered by Retired Unbundled RECs³	0.0%	0.0%	0.0%	0.0%

¹ The eligible renewable percentage above does not reflect RPS compliance, which is determined using a different methodology.

² Unspecified power is electricity that has been purchased through open market transactions and is not traceable to a specific generation source.

³ Renewable energy credits (RECs) are tracking instruments issued for renewable generation. Unbundled renewable energy credits (RECs) represent renewable generation that was not delivered to serve retail sales. Unbundled RECs are not reflected in the power mix or GHG emissions intensities above.

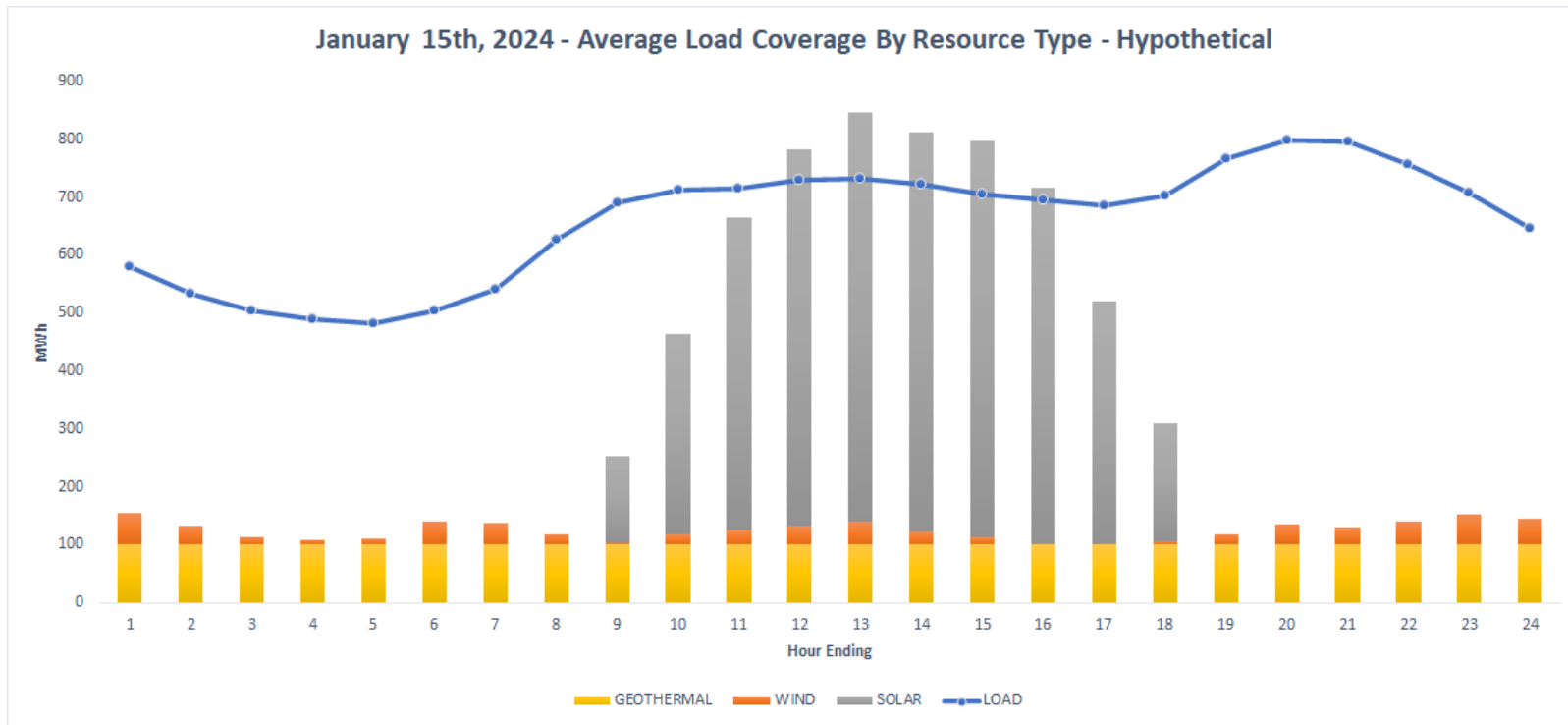
For specific information about this electricity product, contact:	East Bay Community Energy 1-833-699-EBCE (3223)
For general information about the Power Content Label, please visit:	http://www.energy.ca.gov/pcl/
For additional questions, please contact the California Energy Commission at:	Toll-free in California: 844-454-2906 Outside California: 916-653-0237

SECTION 3:

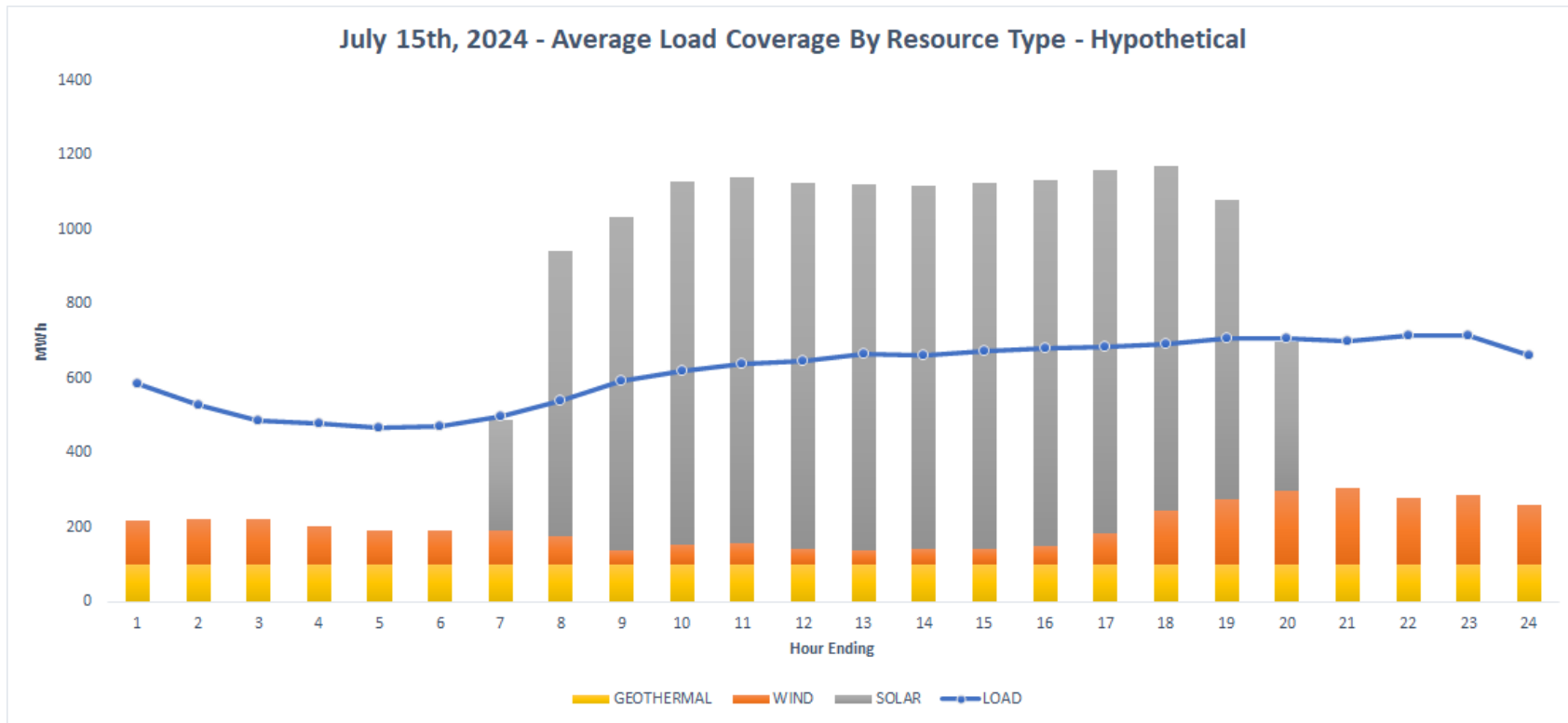
How Do We Build a (RPS) Portfolio?



Hypothetical Future January

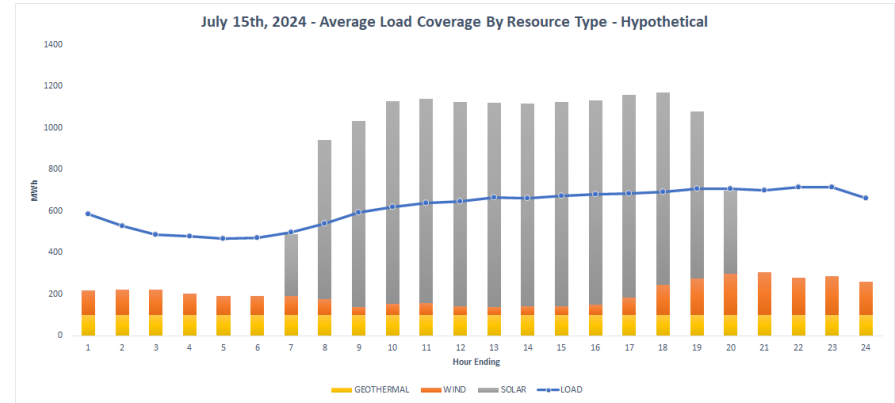
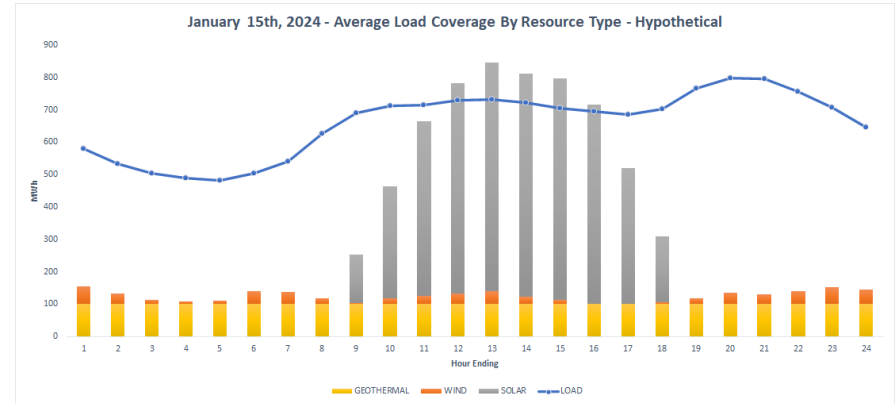


Hypothetical Future July



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

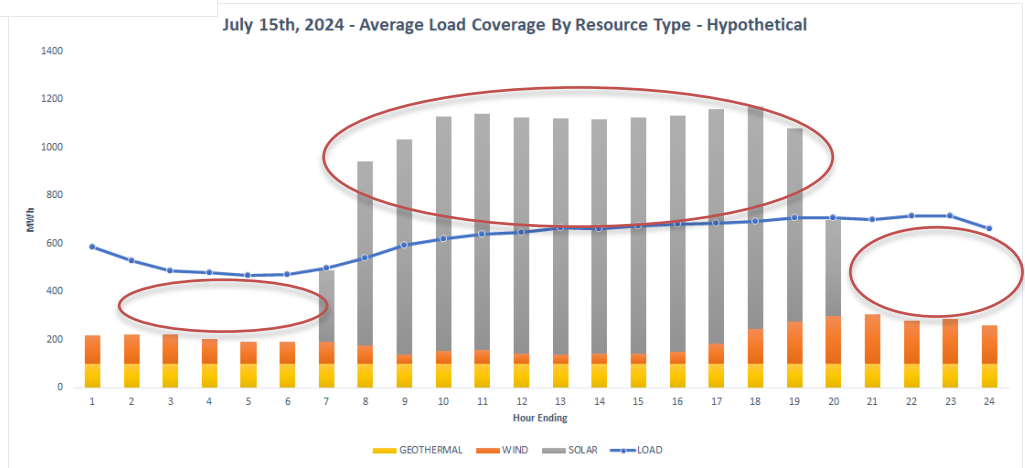
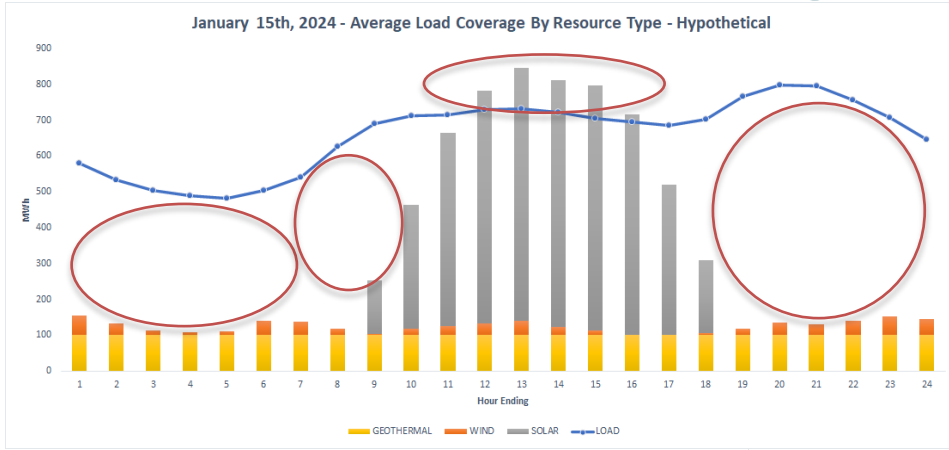
Prioritization

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

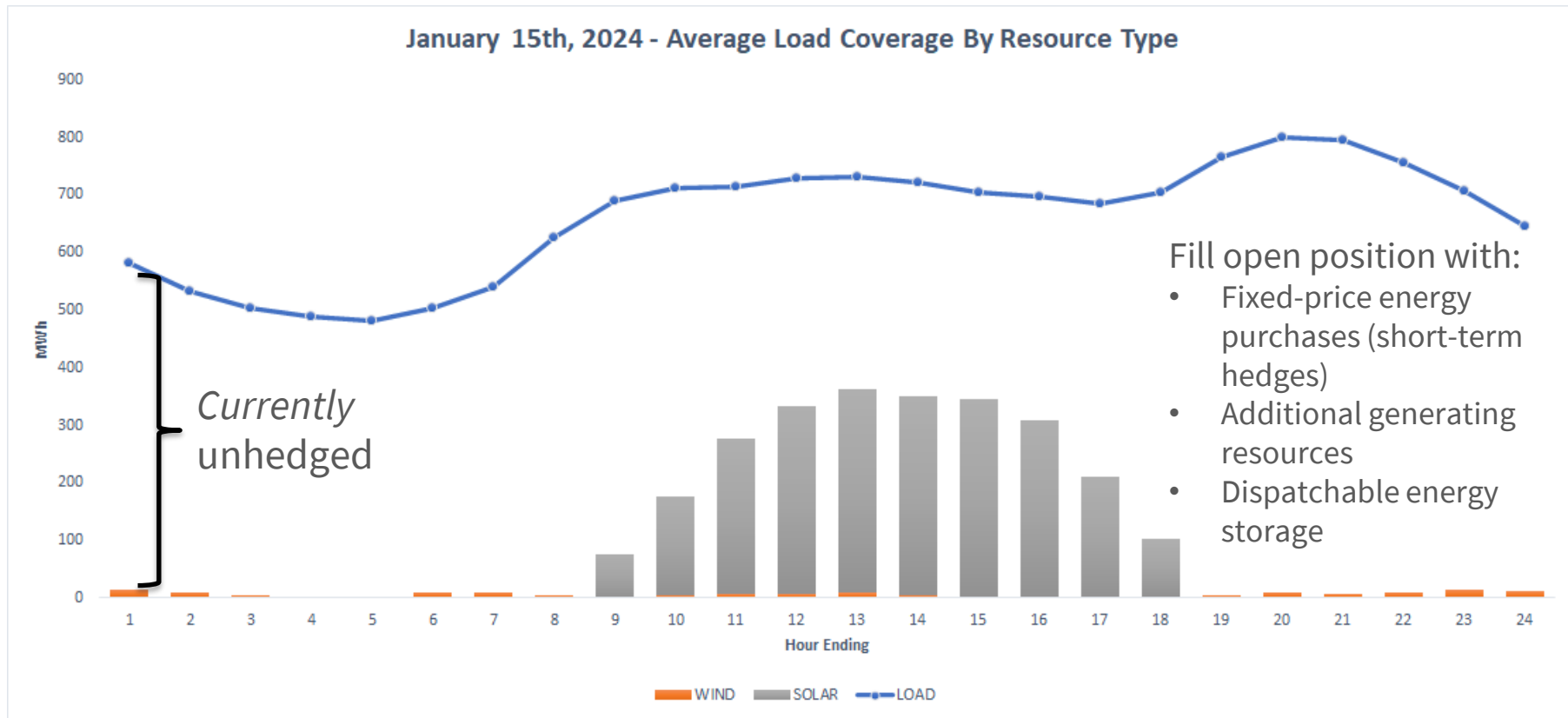
Valuation

- 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



Step 4: Go-to-Market

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

SECTION 4:

Energy Risk Mgmt & Risks to the Business



Energy Risk Management

Risk Management Objectives

- Mitigate Exposure to Volatility
- Durable Rates
- Financial Stability
- Regulatory Compliance

Key Energy Market Risks

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



Long-Term to Short-Term Hedge Strategy

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

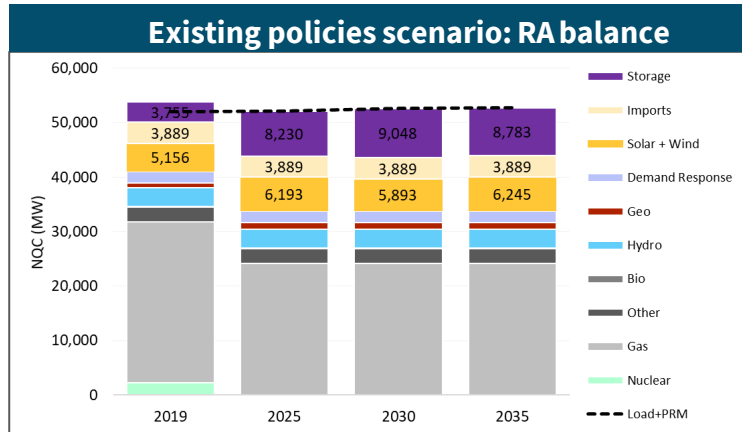
Example:

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%



Nuclear and OTC plant retirements reduce capacity supply significantly by 2025

- Diablo Canyon retirement results in 2.3 GW capacity shortfall in 2025
- OTC plant retirements result in 3.6 GW net capacity shortfall after repowering
 - Deeper near-term shortfall with shutdown of Alamosa, Redondo, etc.



Note: Storage added to the AURORA capacity expansion portfolios when a capacity shortfall is observed.

Current CAISO planned additions and retirement by technology (NQC MW)

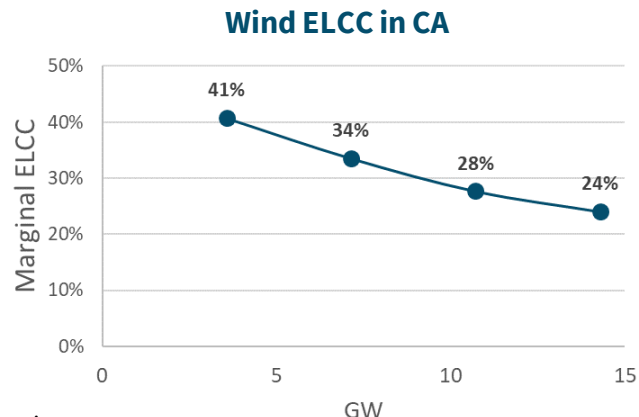
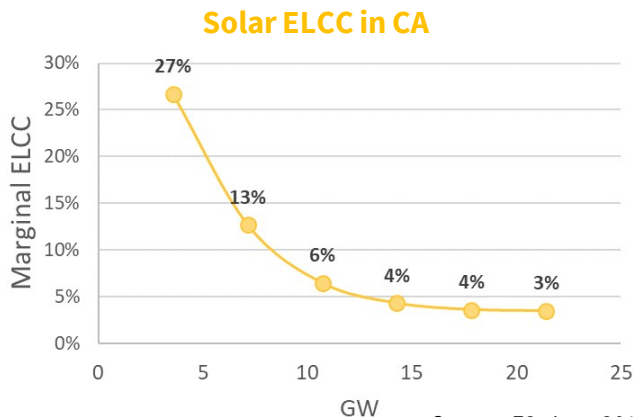
Technology	2019	2020	2021	2022	2023	2024	2025	Total
Nuclear	0	0	0	0	0	0	-2,280	-2,280
Bio / Geo	30	346	0	0	0	0	0	376
Storage	98	693	120	135	160	0	0	1,205
Natural Gas	-1,557	-2,398	0	400	0	200	0	-3,574

Note: Negative numbers above mean resource retirements

Net loss of nearly 6 GW of firm capacity by 2025, all of which must be replaced with renewables and storage

ELCC (Effective Load Carrying Capacity) from solar and wind additions

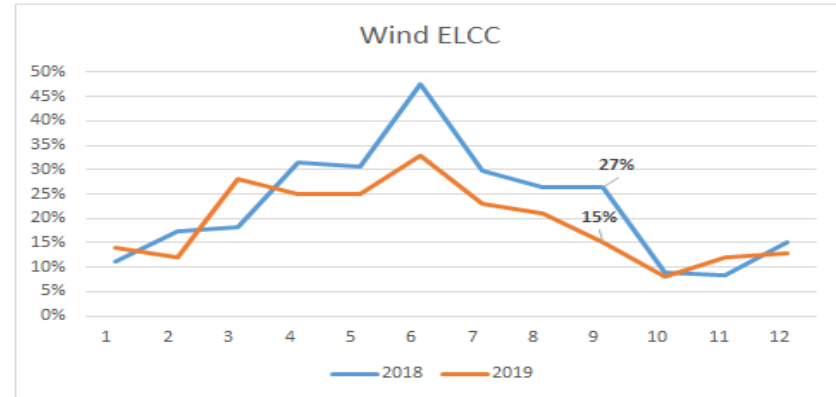
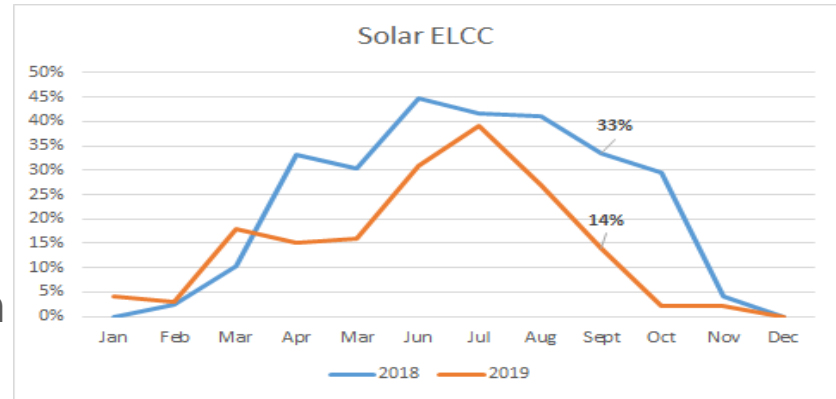
- Solar and wind offer diminishing contributions to RA as penetration grows, particularly for solar, which is already facing low marginal ELCC
 - Even 40 GW of new solar will not reduce peak demand significantly from today
- Diversity benefits exist both for technological diversity and geographical diversity (not shown below), meaning a portfolio of solar, wind, and storage may offer a higher ELCC than the sum of its parts



Source: E3, June 2019 Board Presentation

Solar and Wind ELCC

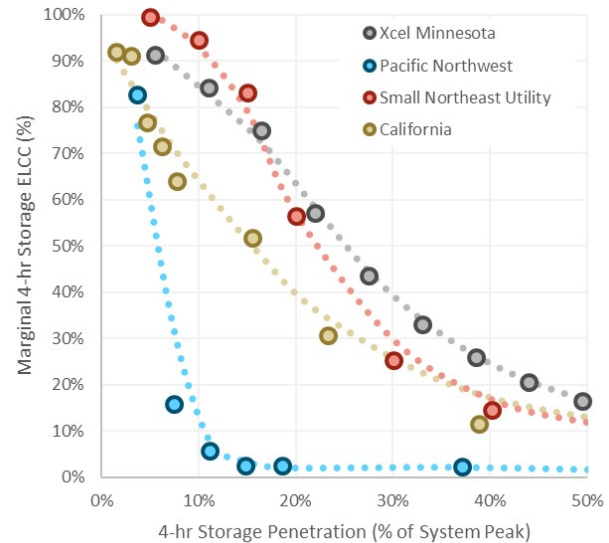
- Simple avg of Solar ELCC has declined from 23% to 14% from 2018 to 2019 respectively
- Simple avg of Wind ELCC has declined from 23% to 19% from 2018 to 2019 respectively
- The summer reflects the most constrained RA season with September being the most constrained



ELCC of battery storage additions

- E3 studied the ELCC of storage in many jurisdictions with varied findings
 - ELCC of storage interacts with net load shape and renewable penetration, synergy with solar
- In the model E3 used step-downs in RA contribution from storage for CA
 - 4-hr storage: 100% ELCC up to 4 GW
 - 6-hr storage: 100% ELCC up to 4GW
 - 8-hr storage: 100% ELCC up to 4GW
 - 12-hr storage: 100% ELCC up to 4 GW
- RA met by storage is increasingly expensive due to long-duration needs
 - New 4-hr storage sets RA price in early 2020s
 - By 2025, 4-hr storage offers declining ELCC and 6-hr storage is required for 100% ELCC (or 4-hr storage is derated by 33%)
 - By 2035, 8- to 12-hr storage is needed for 100% ELCC, or 2-3x as much as 4-hr storage

Marginal ELCC of storage at varying penetrations



Source: E3 Analysis

QUESTIONS & DISCUSSION

