

December 13, 2023

How to navigate changing energy market rules for energy storage and renewables



Alva Svoboda

Principal Analyst, Short-Term
Electric Supply Planning
and Strategy

PG&E



Drew Skau

Principal Product Manager

Fluence



Moderated by

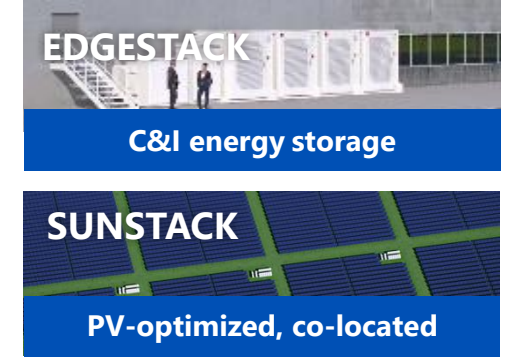
Andy Colthorpe

Deputy Editor in Chief

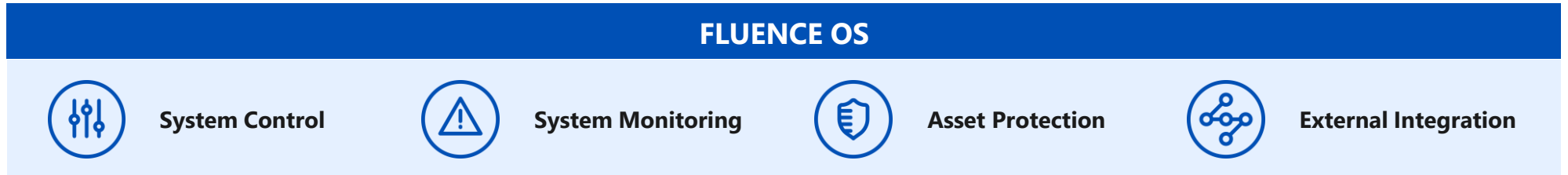
**Energy-Storage.news /
Solar Media**

Proven energy storage products, services and digital solutions

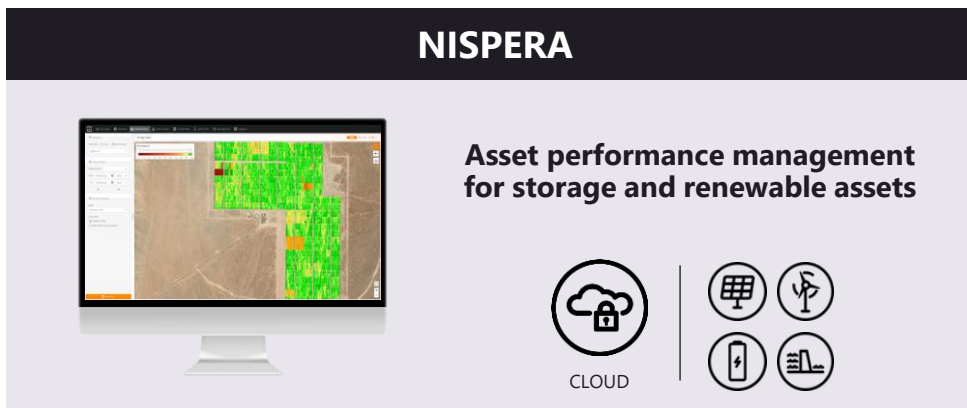
ENERGY STORAGE PRODUCTS



INTEGRATED CONTROLS PLATFORM



OPTIMIZATION SOFTWARE FOR STORAGE + RENEWABLES



Fluence Mosaic

Maximizes renewables and storage revenue with intelligent, automated bidding software, so you can deploy and use more clean energy with higher ROI



25+

market experts
on staff



11+

GW of assets under
management or
contracted



50+%

revenue uplift for storage
assets compared to
manual trading
techniques

Available in



CAISO



ERCOT



NEM



Overview of PG&E in the California electric grid and markets

- Generation ownership, tolling agreement rights, and other supply contracts
- Transmission ownership
- Distribution ownership and operations
- Participation in California Independent System Operator (CAISO) markets
 - Roles as Investor-Owned Utility, Load Serving Entity and Scheduling Coordinator
- California's objective is decarbonization of electricity by 2045

Challenges facing
storage asset owners
and operators
participating in
wholesale energy
markets



OPTIMIZATION



MARKET EVENTS



MARKET CHANGES





Why is optimization a challenge for bidding storage?



Manual trading techniques increase the chance of violation of warranty parameters due to human errors.



Limited foresight into actual possible optimization results leads to undesirable behavior by having to buy back in real-time during delivery.



Doing either physical or market modeling is not enough because a bid must be deliverable and compliant in the end.



How does a bid optimization tool solve this?



ALL OPTIONS CONSIDERED

Stochastic optimization explores all pathways within a suite of input scenarios to find the solution that achieves the design objective



HANDLES COMPLEXITY

Effectiveness doesn't break down as complexity increases



UNIVERSALLY OPTIMAL

Identifies truly optimal schedule for a resource to follow, rather than locally optimal solutions produced by heuristics



How bid optimization helped PG&E overcome this challenge

1

Initially managed Vaca Dixon/Yerba Buena pilots with in-house software



2

Gained understanding of optimization and bidding prior to Elkhorn asset go-live



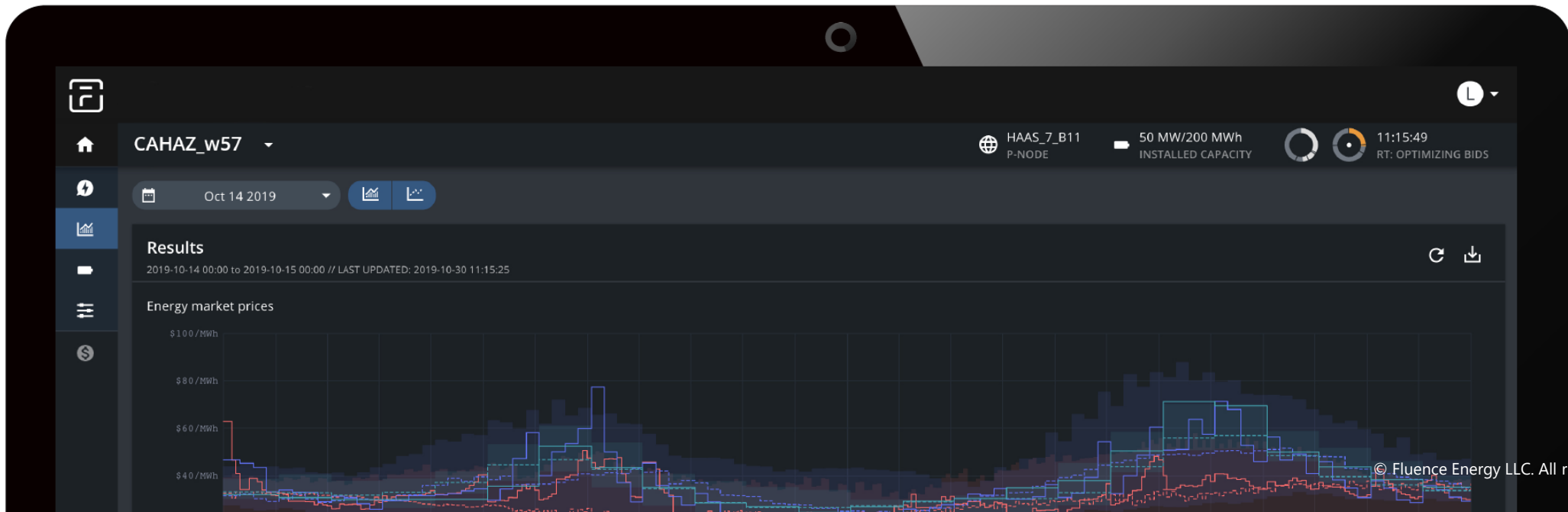
3

Tested with simulated asset



4

PG&E was able to use Mosaic to bid into the market from Day 1 of operations





Why are market events a challenge for bidding storage?



Prices become volatile due to unanticipated events and increasing proportion of variable renewables.



A set strategy isn't going to find the optimal solution when market events occur.



Even with an optimization tool that includes these market events, different products in different markets interact in ways that cannot always be anticipated.



How does a bid optimization tool solve this?



ADVANCED PRICE FORECASTING

Robust ML-based price predictions continually improve



DYNAMIC STRATEGY

No set strategy; rather looks for optimal schedule



INTEGRATED FORECASTING & OPTIMIZATION

Events of varying probabilities are considered within the scenarios of stochastic optimization



How bid optimization helped PG&E overcome this challenge



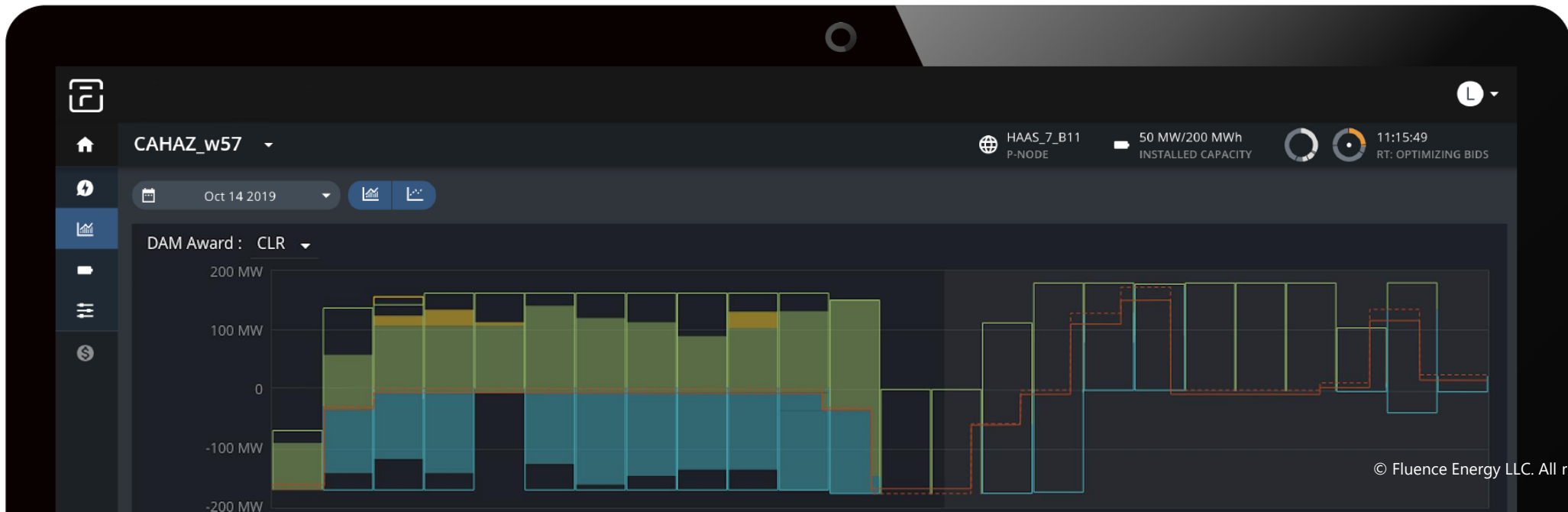
Optimization settings finds optimal solutions based on forecast market conditions.



Risk settings manage exposure to uncertainty in prices and award quantities in diverse services and energy.



Configuration settings allow fine tuning of product behavior.





MARKET CHANGES

Why are market changes a challenge for bidding storage?



Constant market changes impact essence of how storage is bid into the market.



Translating the evolving market and bidding considerations into optimization becomes challenging.



It can be difficult for participants to anticipate the full impact of new rules.



MARKET CHANGES

How does a bid optimization tool solve this?

Fluence experts proactively ensure successful change implementation

MARKET OPERATOR

- Fluence works closely with operator to understand and give feedback on new rules and their impact



OPTIMIZATION PLATFORM

- Fluence translates market rules into mathematical equations needed to bid optimally

MARKET PARTICIPANT

- Fluence enables customers to intervene, override, or adjust optimization and bids as desired
- Fluence offers guidance on meaning and impact of market rule changes



How bid optimization helped PG&E overcome this challenge

For Energy Storage Enhancement changes recently, CAISO has adjusted how regulation is handled:

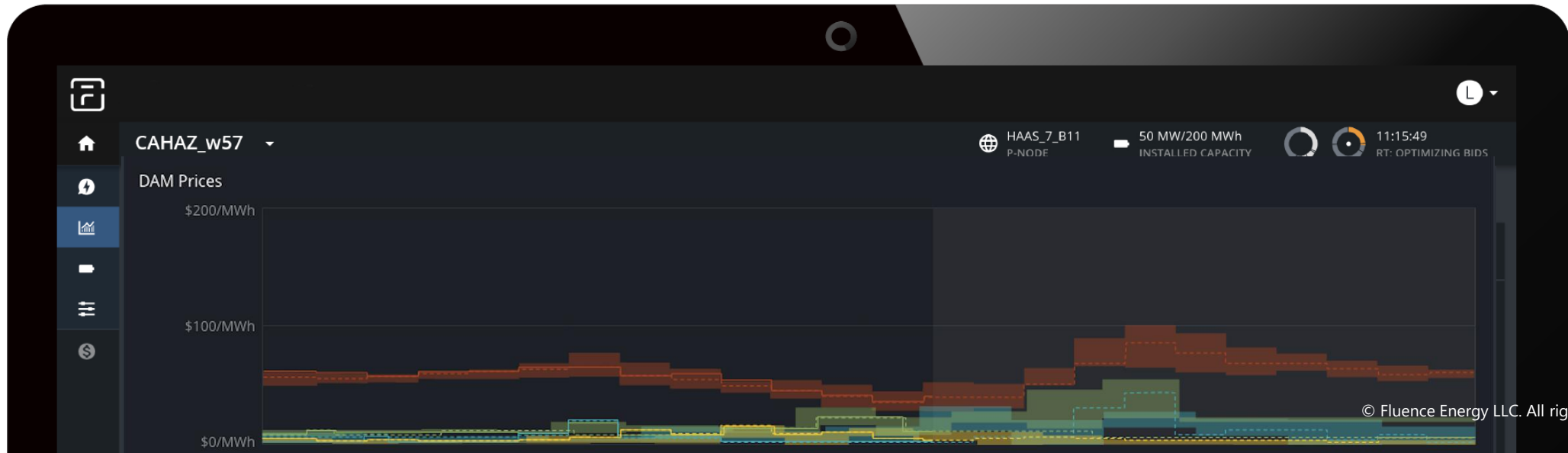
1

Mosaic has modeled the new limits and throughput expectations to ensure predictable awards and SOC.

2

Mosaic has provided tools for handling throughput uncertainty.

- Setting target SOC in RT bids.
- Setting expected regulation throughput for Mosaic's physical model.



Upcoming Challenges

1

Hybrids Resources

2

Upcoming CAISO Market Changes

- Imbalance Reserve products

Connect with us to learn more. Questions?



Alva Svoboda, Ph.D.

PRINCIPAL ANALYST

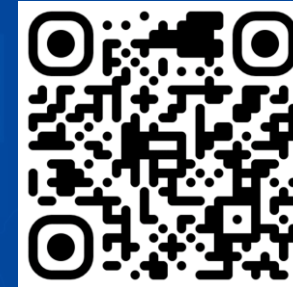
ajsh@pge.com



Drew Skau, Ph.D.

PRINCIPAL PRODUCT MANAGER

drew.skau@fluencenergy.com



About Mosaic
Intelligent
Bidding
Software

<https://bit.ly/3R9renl>

