



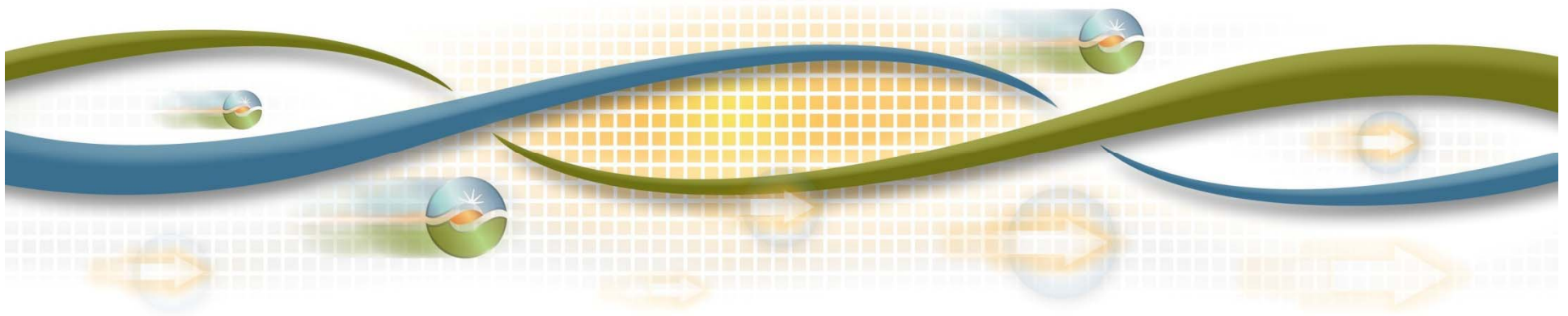
California ISO
Shaping a Renewed Future

California's Evolving Energy Market

California Power Market Symposium
Portland, Oregon

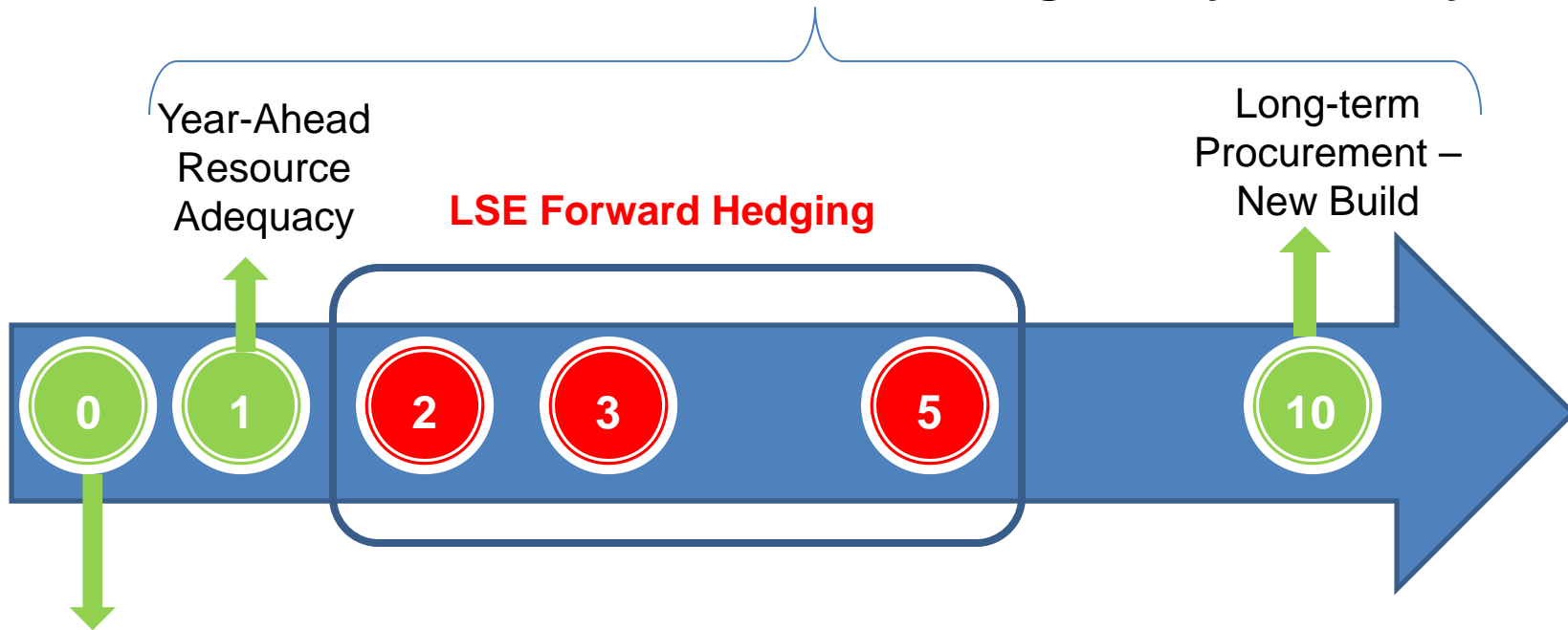
September 5, 2013

Keith Casey
Vice President Market & Infrastructure Development
California ISO



California Market - Today

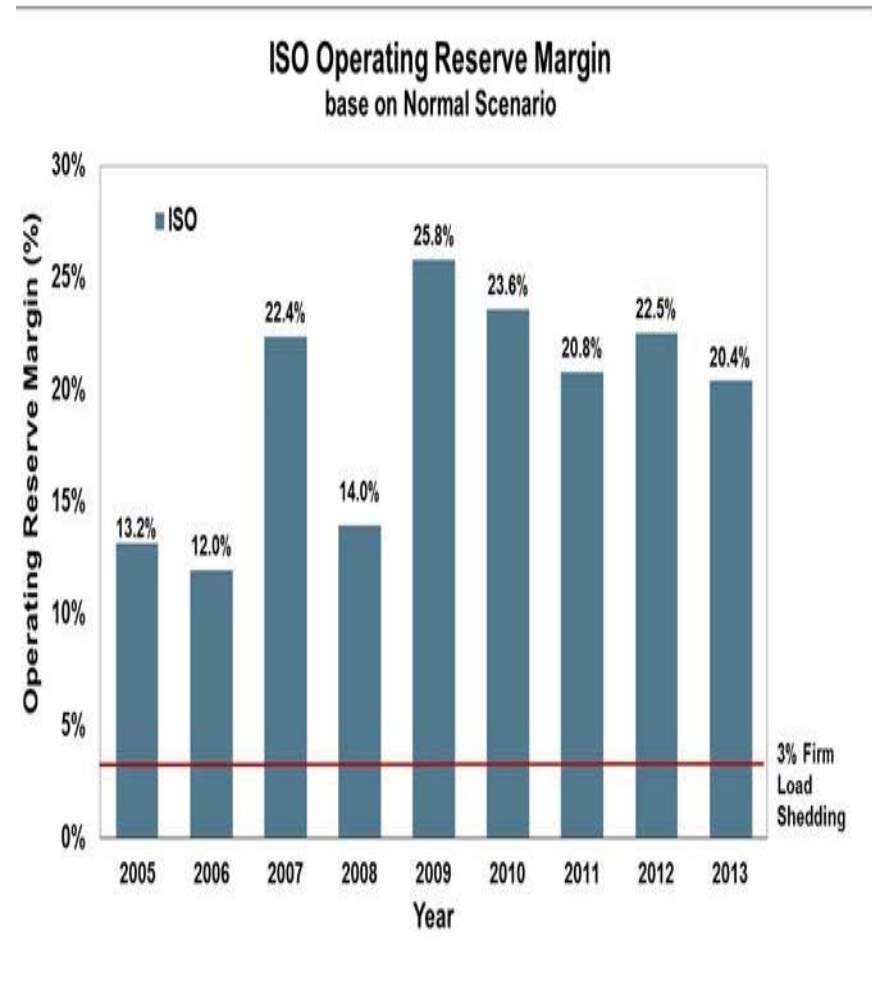
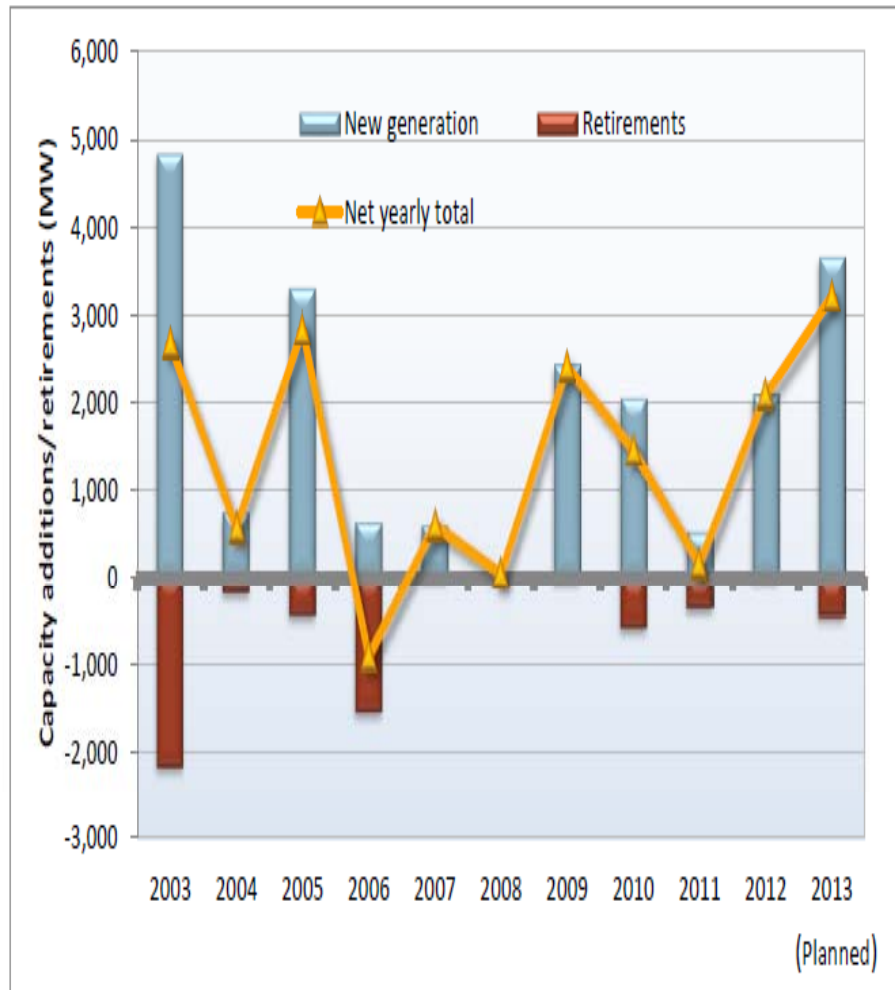
Bilateral Procurement – State Regulatory Authority



CAISO Market – FERC Jurisdictional

- Day-Ahead and Real-time Spot Market
- Energy & Ancillary Services

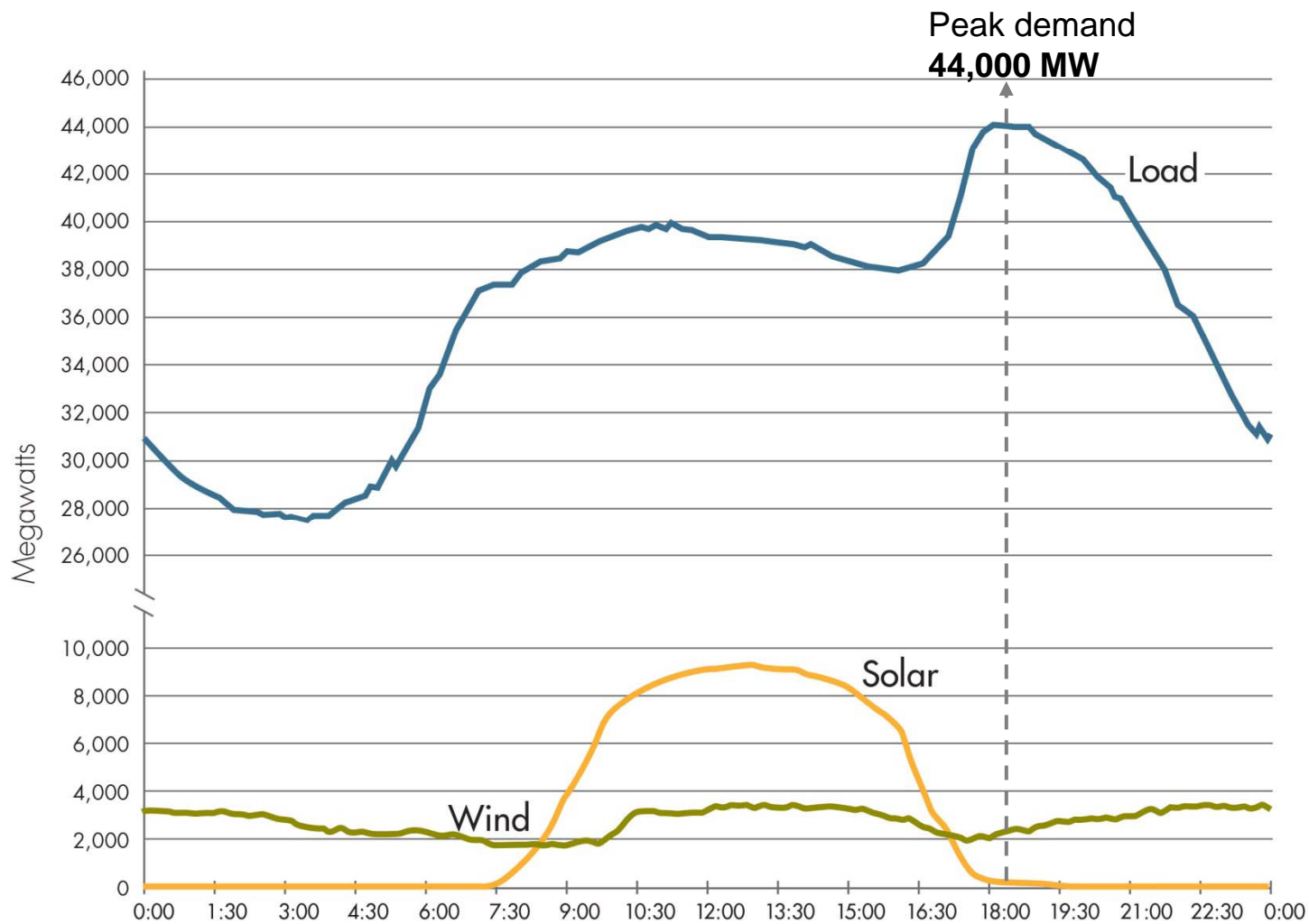
Significant Generation Investment over Past Decade



California Energy and Environmental Policy Drivers

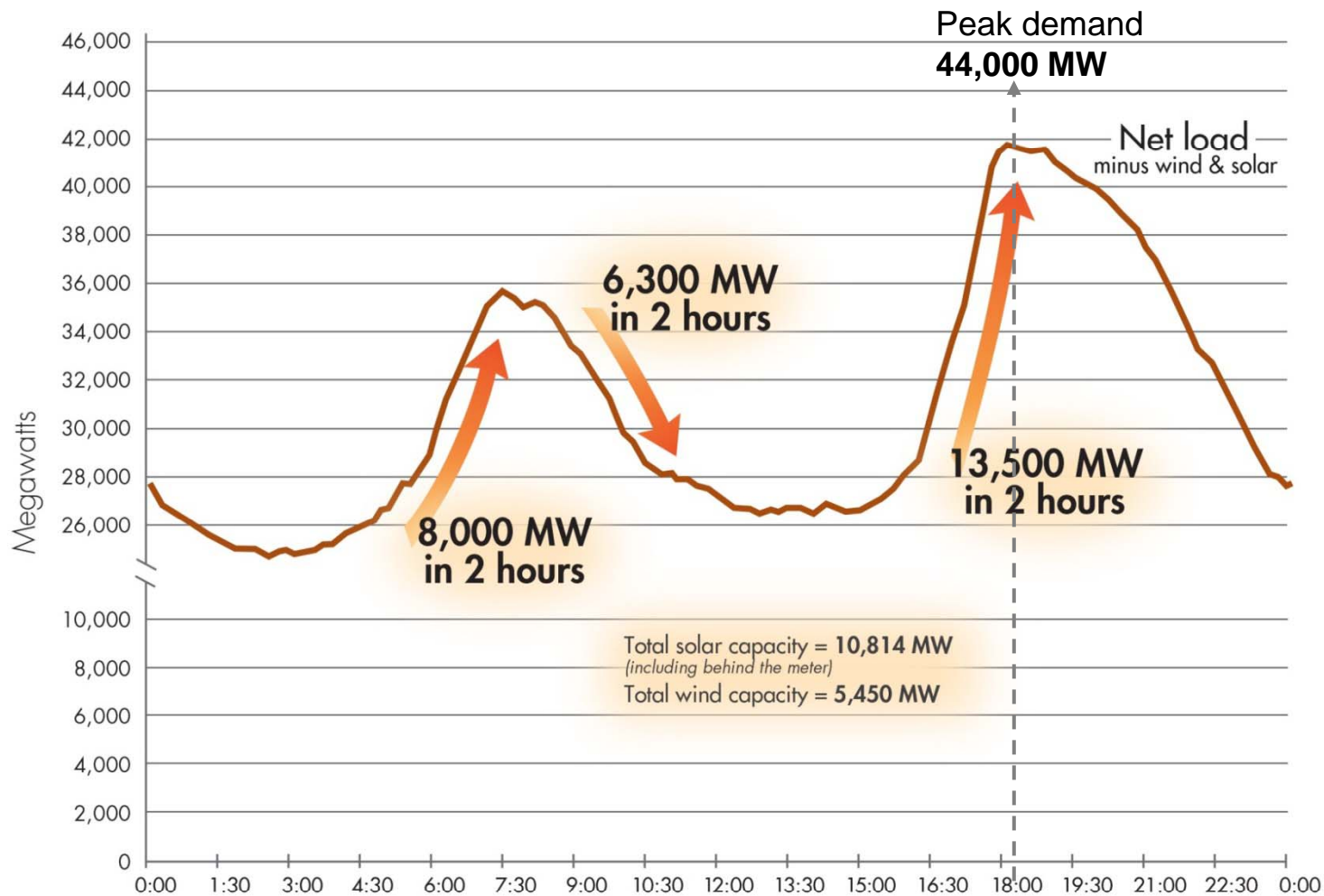
- Greenhouse gas reductions to 1990 levels by 2020
- 33% of load served by renewable generation by 2020
- 12,000 MW of distributed generation by 2020
- Ban on use of once-through cooling in coastal power plants
- Limits on availability of air emission credits for replacement generation

Interaction of Wind & Solar on Net-Load Profile (1)



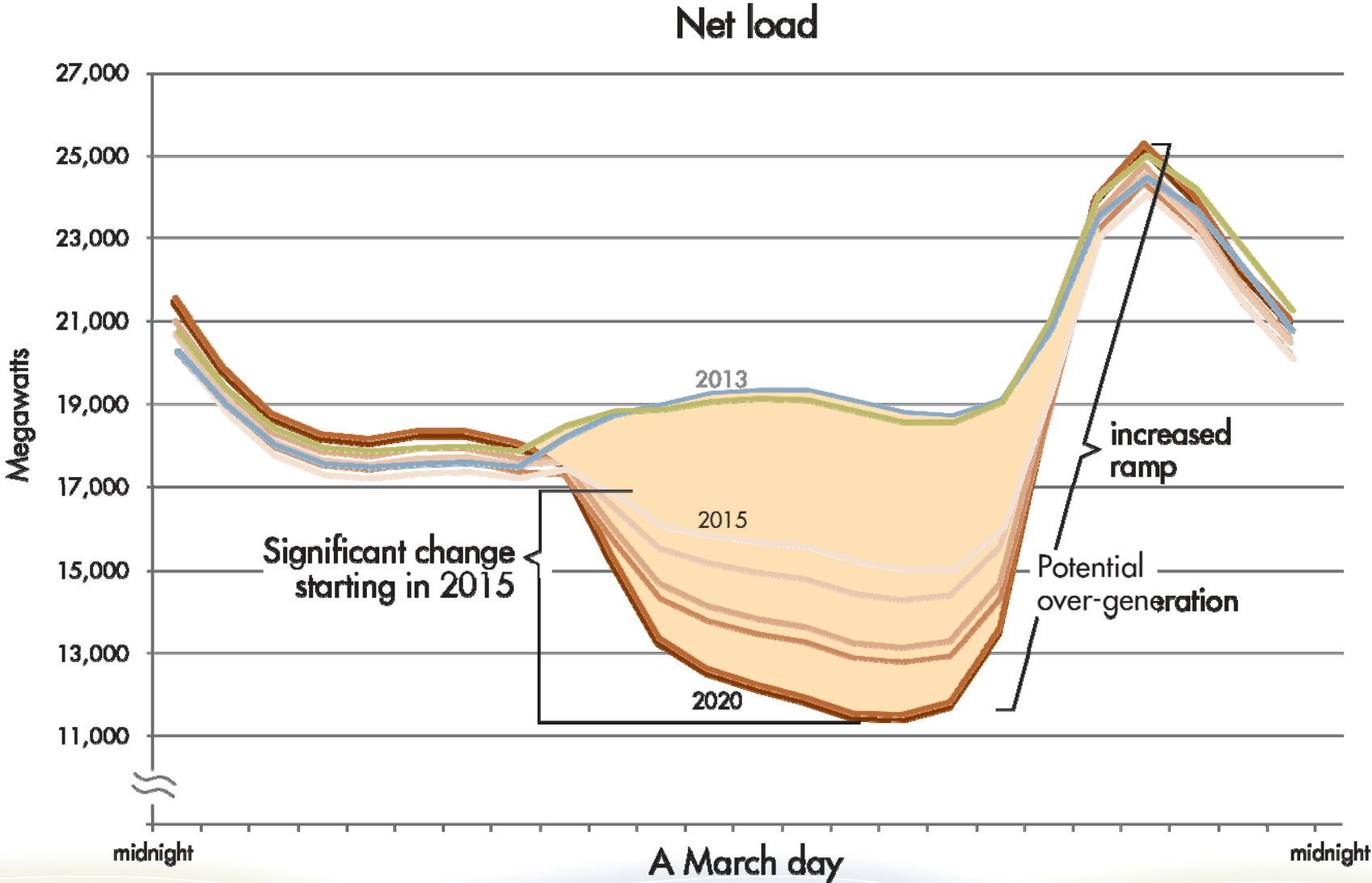
Sample winter day in 2020

Interaction of Wind & Solar on Net-Load Profile (2)



Sample winter day in 2020

Operational needs are significantly changing between 2013 and 2020



Our Challenge

- System needs (ramping, load following, etc) changing dramatically over this decade.
- Resource mix changing dramatically
 - Increasing levels of wind & solar
 - Decreasing levels of flexible/dispatchable resources due to:
 - OTC Retirements
 - Potential retirements due to current market conditions

Challenges –

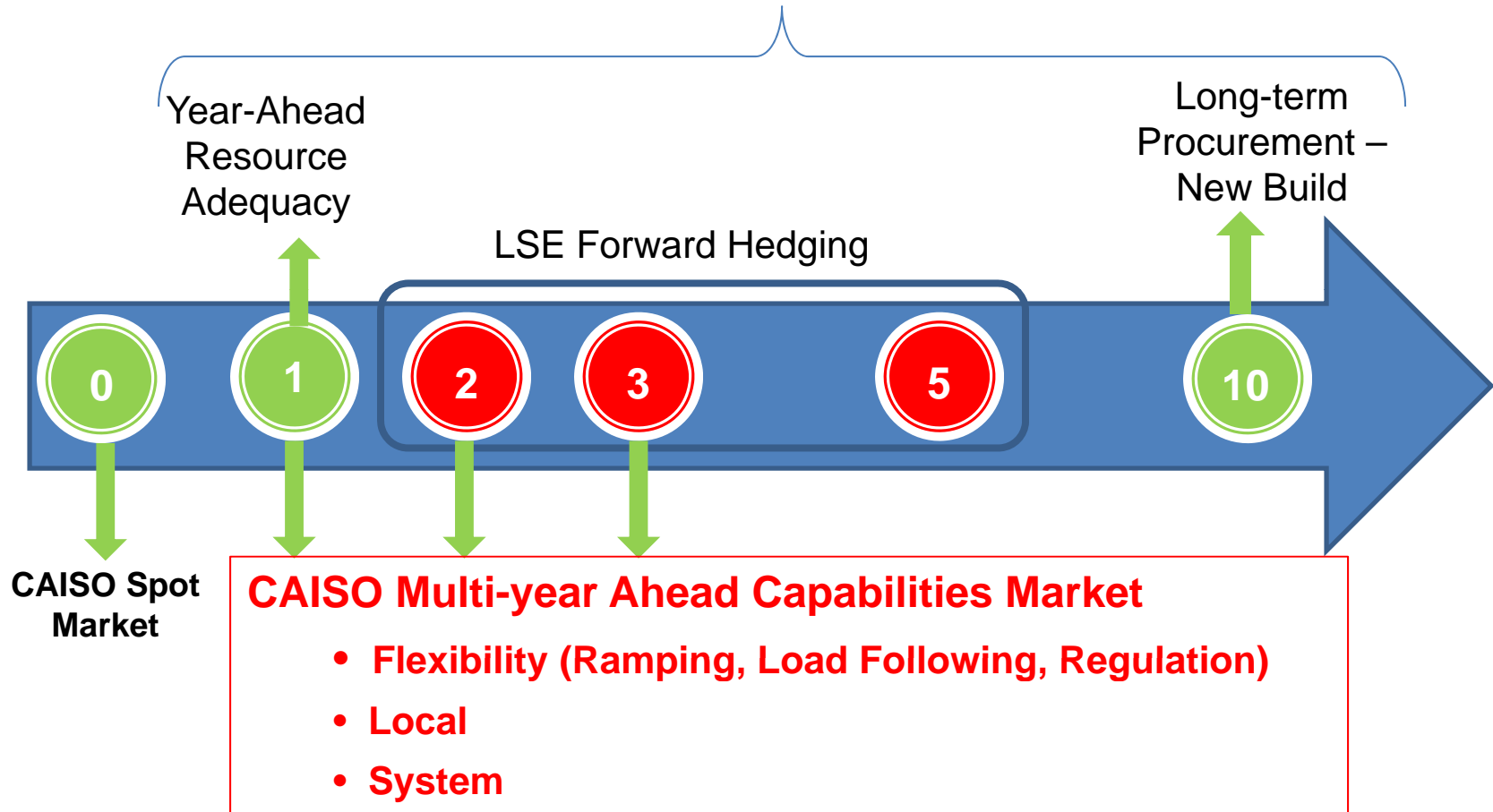
How to ensure we identify and secure the resource capabilities needed in future years.

How to ensure we optimally utilize and price resource capabilities in the ISO markets.



Should the CAISO pursue a Multi-year Ahead Capabilities Market?

Bilateral Procurement – State Regulatory Authority



CAISO market design is evolving to meet changing needs of the system.

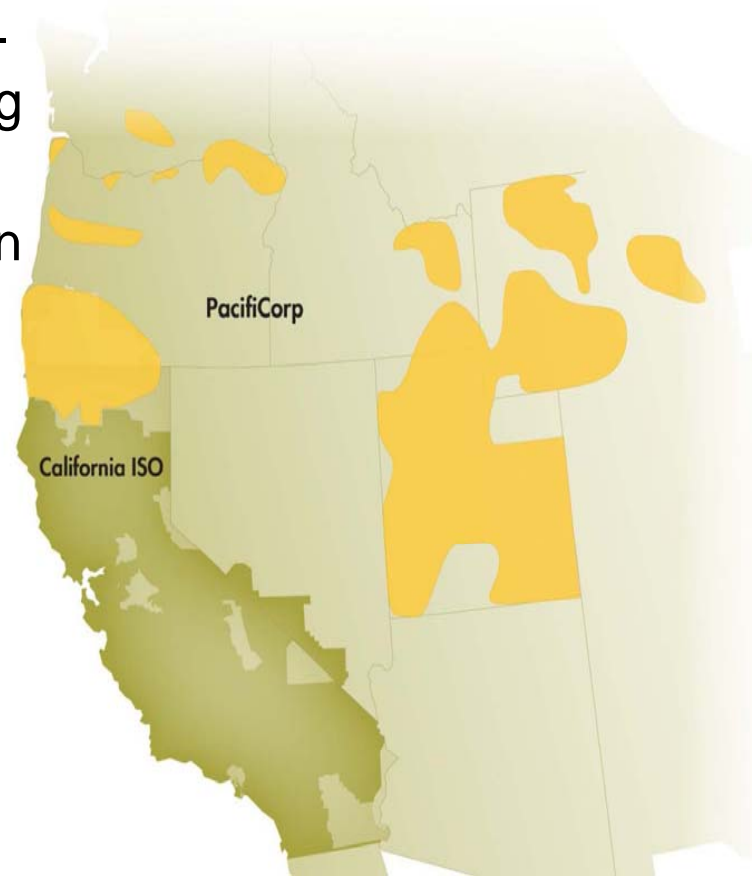
- LMP Market Design (April 2009)
 - Security constrained unit commitment and economic dispatch
 - Day-ahead and Real-time
 - Co-optimize energy and ancillary services (Regulation, Spin, Non-Spin)
- Key Enhancements (2011 - 2013)
 - Flexible Ramping Constraint
 - Regulation Energy Management
 - Multi-Stage Generation Modeling
- Proposed Enhancements (2014)
 - FERC Order 764 (15-minute inter-tie scheduling, 15-minute market)
 - Flexible Ramping Product
 - Energy Imbalance Market – CAISO/PacifiCorp Agreement

FERC Order 764

- FERC Order 764 requires:
 - Transmission providers to offer an option to schedule energy in 15-minute increments, and
 - Variable energy resources to provide meteorological and forced outage data
- Compliance created opportunity to revamp ISO real-time market design.
 - Proposing a full three settlement market
 - Day-Ahead, 15-Minute Market, 5-minute market
 - Real-time fixed hourly-intertie transactions settled as price takers
 - Convergence bids settled between Day-Ahead and 15-minute market.
 - Improved forecasting and market settlements for VERs.
- Implementation planned for Spring 2014

CAISO Energy Imbalance Market (EIM)

- CAISO developing EIM to optimize real-time balancing across multiple balancing areas.
- PacifiCorp and ISO have entered into an EIM implementation agreement.
- Implementation planned for Fall 2014.
- Stakeholder process on design is well underway and making good progress.
- Governance proposal – seeking to establish meaningful independent regional oversight.



California's Evolving Energy Market

CAISO Spot Market Design

- Increasingly sophisticated
- Defining & pricing needed resource capabilities
- Removing barriers to broader participation
 - Regionally & Clean/smart technologies

Optimally utilize and price resource capabilities in the ISO markets

Multi-Year Procurement Framework

- State regulated
- Procurement requirements evolving
 - Local, System, Flexibility
- Promoting clean technologies

Identify and secure the resource capabilities needed in future years.