



April 30, 2020

Jeff Spires

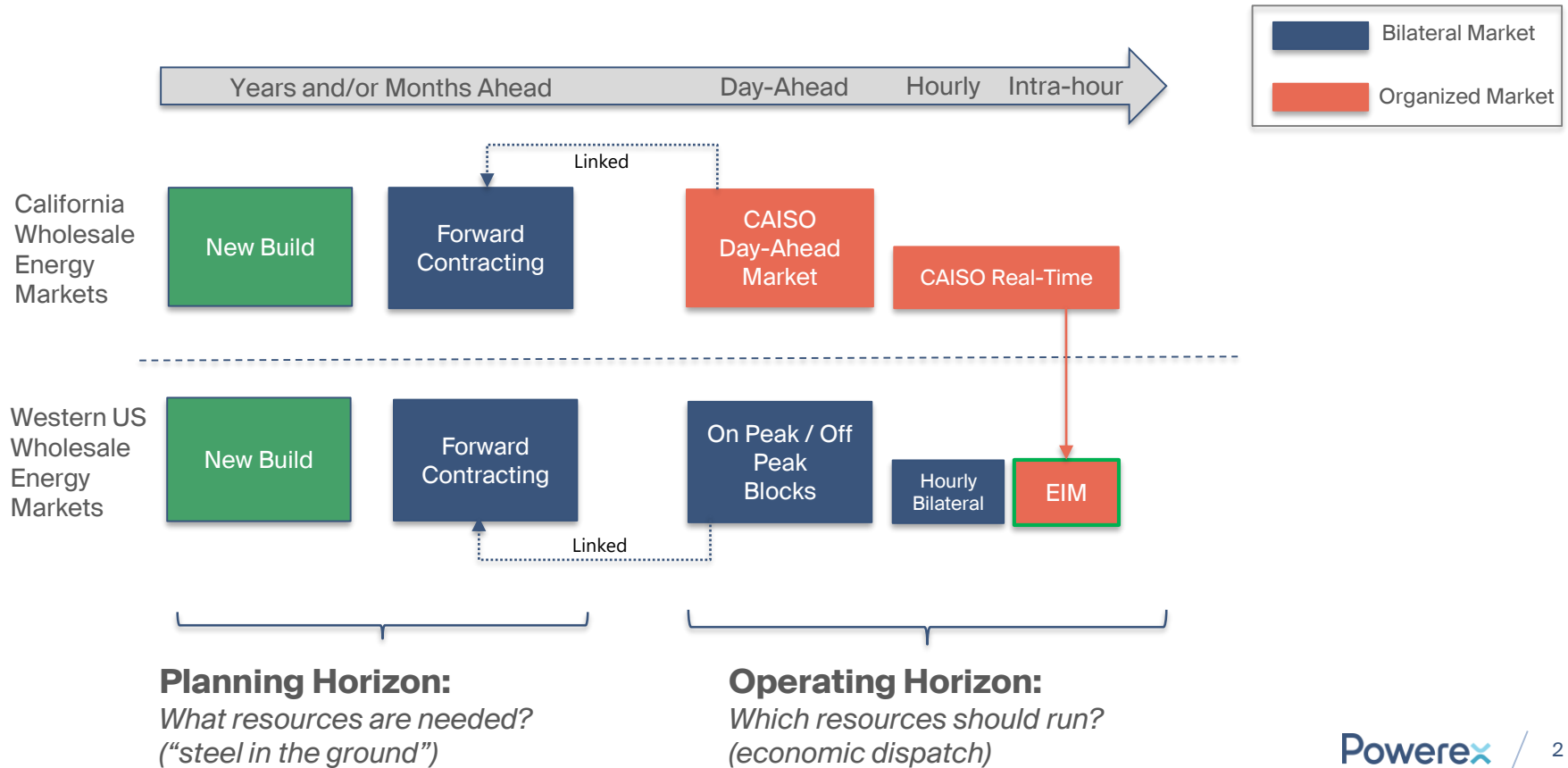
Director, Power

CETA Market Workgroup

Energy Markets Overview

Supply. Flexibility. Commitment.

Trading in Western U.S. Markets



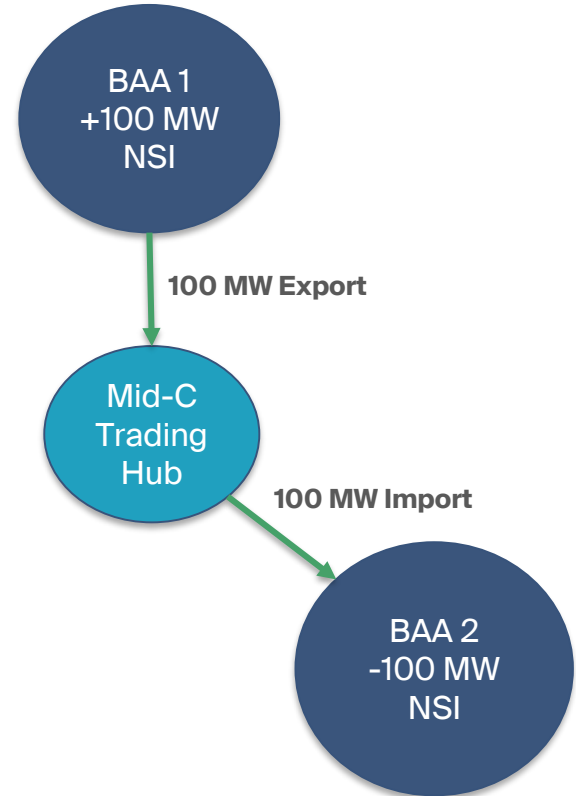
Nature of Bilateral Markets

- Multiple buyers and sellers
 - Each trade occurs between a **single buyer** and **single seller** at a **negotiated price**
 - Trades executed through electronic exchange (i.e., ICE), brokers, phone
- Standardization facilitates efficiency:
 - **Location:** Trading Hubs (e.g., Mid-C or Paloverde)
 - **Time Period:** On-Peak and Off-Peak Blocks
 - **Product Quality:** Firm, Unit Contingent, Non-Firm
 - **Contract Terms:** e.g., WSPP Schedule C
 - **Carbon:** “Unspecified” or Resource-specific
- Bilateral wholesale energy markets enable large volumes of regional trade across the West



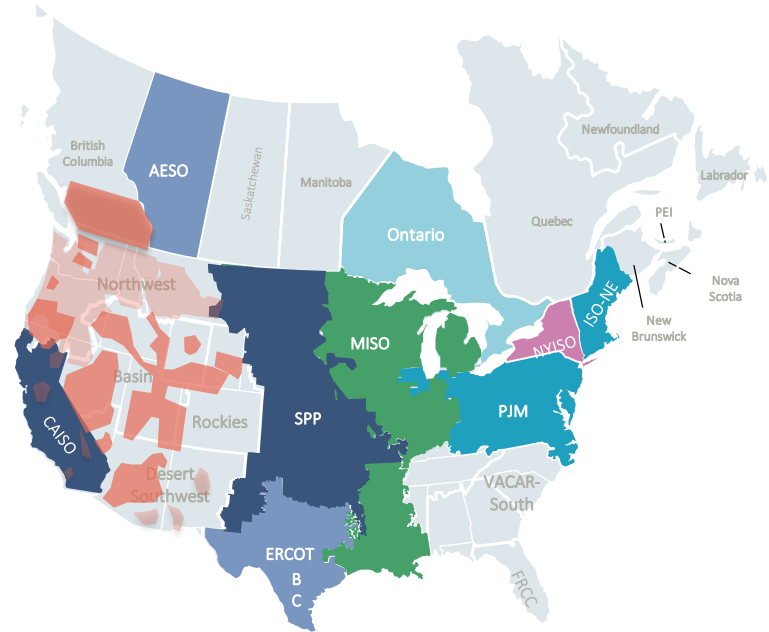
Arranging Bilateral Transactions

- OATT transmission contracts purchased to deliver to/from transaction location (e.g., trading hub)
 - Transmission contract terms can vary: multi-year → hourly
- **e-Tags** used to provide a detailed electronic schedule
 - All Parties in schedule receive copy of e-Tag (seller, purchaser, tx providers, sending and receiving balancing authority areas)
- Sum of all confirmed e-Tags is the BAA's net scheduled interchange (NSI) for the delivery hour
 - i.e., the BAA's final export or import obligation after considering all transactions
- Within the hour each BA operator balances generation with internal demand and NSI
 - Failing to balance the BAA results in Area Control Error (ACE)
 - BAs subject to NERC-defined performance criteria



Organized Markets In North America

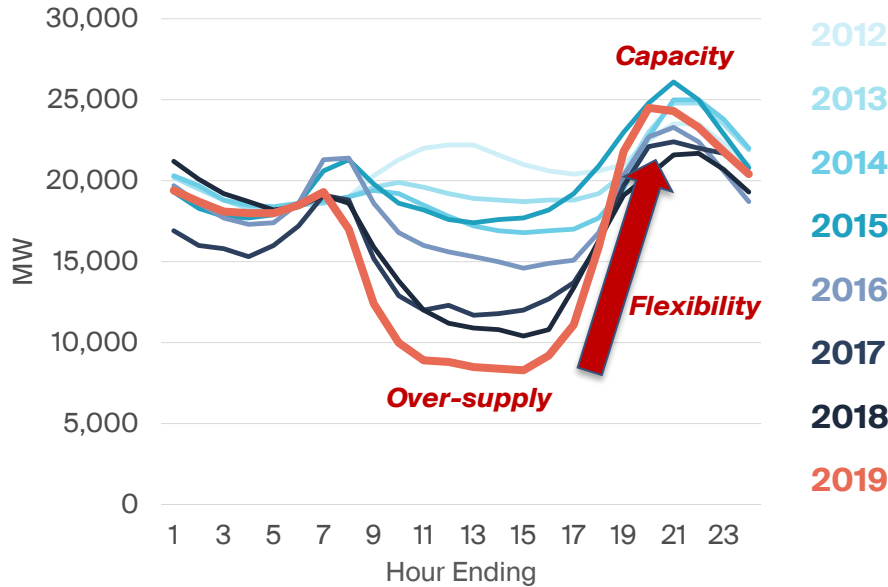
- Central market operator uses software to simultaneously dispatch **all** resources to meet **all** demand within a large regional footprint
 - Participants submit bids and offers
 - Market operator clears all buyers and sellers
 - No explicit link between any individual resource and any individual load
- Results in efficient “least cost” solution subject to transmission limits
 - Locational Marginal Prices (LMPs) at each location within the footprint: energy, congestion, losses
- Day-Ahead (hourly) and Real-Time (5-minute)
 - Real-Time market solution produced as often as every 5-minutes in response to changing grid conditions



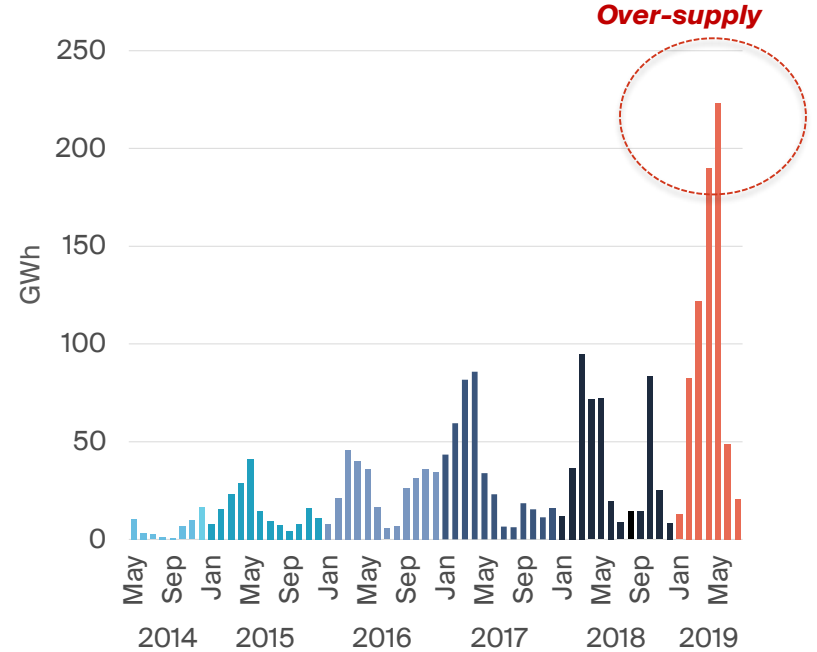
- EIM**
- Active (11)
 - Pending (9)

Western Grid is Evolving

California Net Load



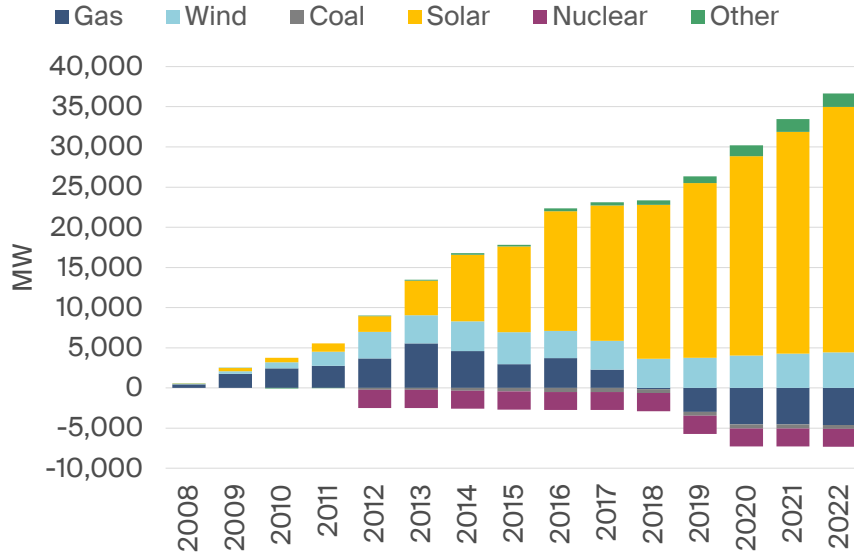
Renewable Curtailments



Source: CAISO Oasis - March 31st Net Load (Load - Renewable Generation)

Western Grid is Evolving

California Capacity Additions and Retirements



2010 Market Need

Energy

2020 Market Need

Energy

DECLINING

Flexibility

INCREASING

Capacity

INCREASING

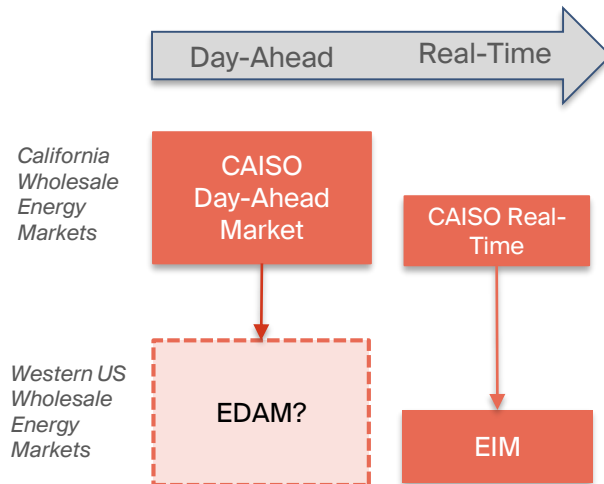
Environmental Attributes

INCREASING

- Bilateral markets less well-suited to increasing variability and uncertainty of the grid
- Regional organized markets are critical to support efficient renewable integration, reducing GHG emissions, and maintaining affordable electricity rates

Trading in Western U.S. Markets: Looking Ahead

- Stakeholders exploring an Extended Day-Ahead Market (EDAM)
 - Voluntary
 - Day-ahead trading with hourly granularity
 - Centralized unit commitment of thermal resources
 - More efficient trading and improved renewable integration
 - Potentially **much larger volume** than EIM
- Requires regional consensus in key areas
 - Governance and oversight
 - Detailed market rules and design
 - Transmission availability (and rates)
 - GHG



Efficient Wholesale Electricity Markets Support State Environmental Policy Objectives

State Environmental Policy Objectives

- Reduce greenhouse gases
- Create clean jobs
- Increase local renewable resources
- Decrease reliance on fossil fuels
- Support electrification
- Achieve objectives at acceptable cost

Efficient Wholesale Electricity Markets Support State Objectives

- Keep rates affordable through efficient trade
- Integrates renewable resources at lowest cost
- Reduces renewable curtailment
- Reduces GHG emissions

... while respecting individual state autonomy and ensuring reliability

Efficient Markets Cannot be Achieved Without Policy Coordination

- Regional organized markets are critical to efficient renewable integration, reducing GHGs, and maintaining affordable electricity rates (example Western EIM)
- Fragmented state environmental policies create challenges in achieving efficient wholesale electricity markets (both organized and bilateral markets)
 - Challenges largely limited to **interstate** electricity trade (i.e., imports and exports)
 - Example: no west-wide agreement on allocation of generation to load
 - Significant volume of interstate trade occurs EVERY hour, **and is necessary**
 - Inefficient wholesale electricity markets undermine state objectives:
 - Higher electricity rates
 - State environmental policies objectives are undermined
 - For example: GHG leakage, reduced buildout of clean / renewable resources
 - Renewable curtailment



Thank You

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