



California ISO

# Operating Challenges and Potential Solutions

**Solar-Thermal power Summit 2019**

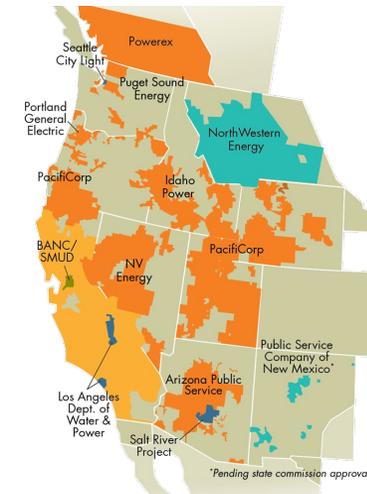
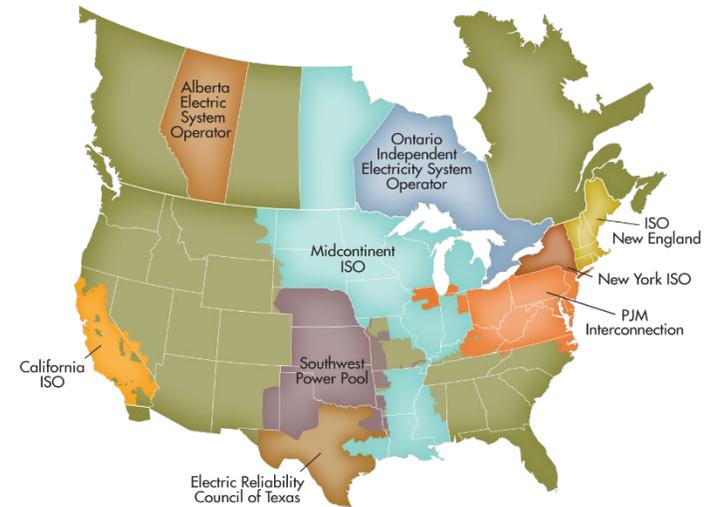
**Marriott City Center, Oakland**

**March 18, 2019**

Clyde Loutan – Principal, Renewable Energy Integration

# The California Independent System Operator (CAISO)

- **Nonprofit** public benefit corporation
  - created by CA statute
  - regulated by the Federal Energy Regulatory Commission (FERC)
  - not a government agency
- **One of 38** balancing authorities in the western interconnection
- **50,270 MW** record peak demand (7/24/2006)
- **Serving 80%** of CA & bit of NV
- **31,000 daily** market transactions
- **\$9.3 billion** market
- **30 million** people served



# California's leaders are aggressively pursuing a low carbon future

- Aggressive renewable energy goals



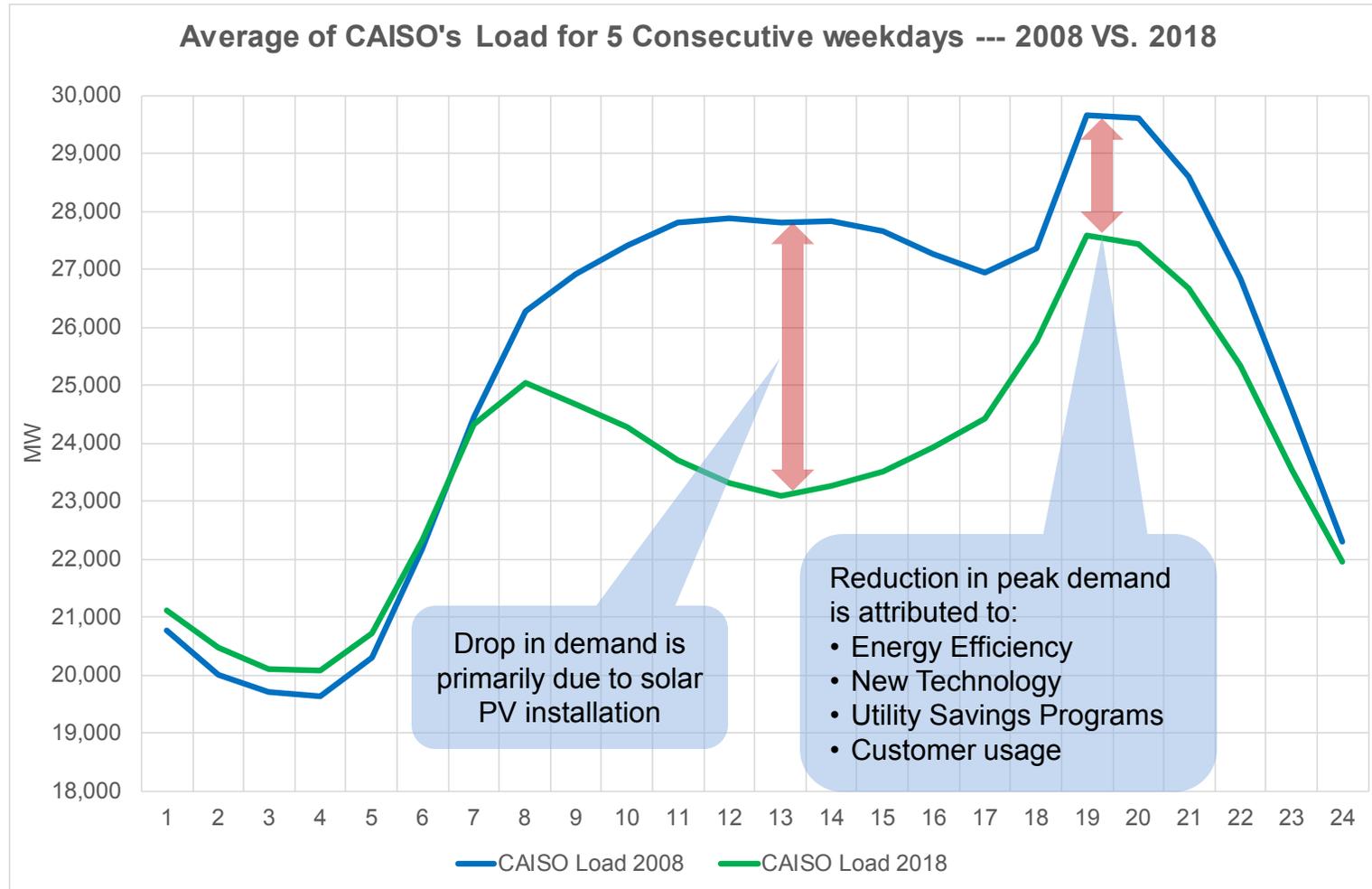
- Deep greenhouse gas (GHG) reduction goals



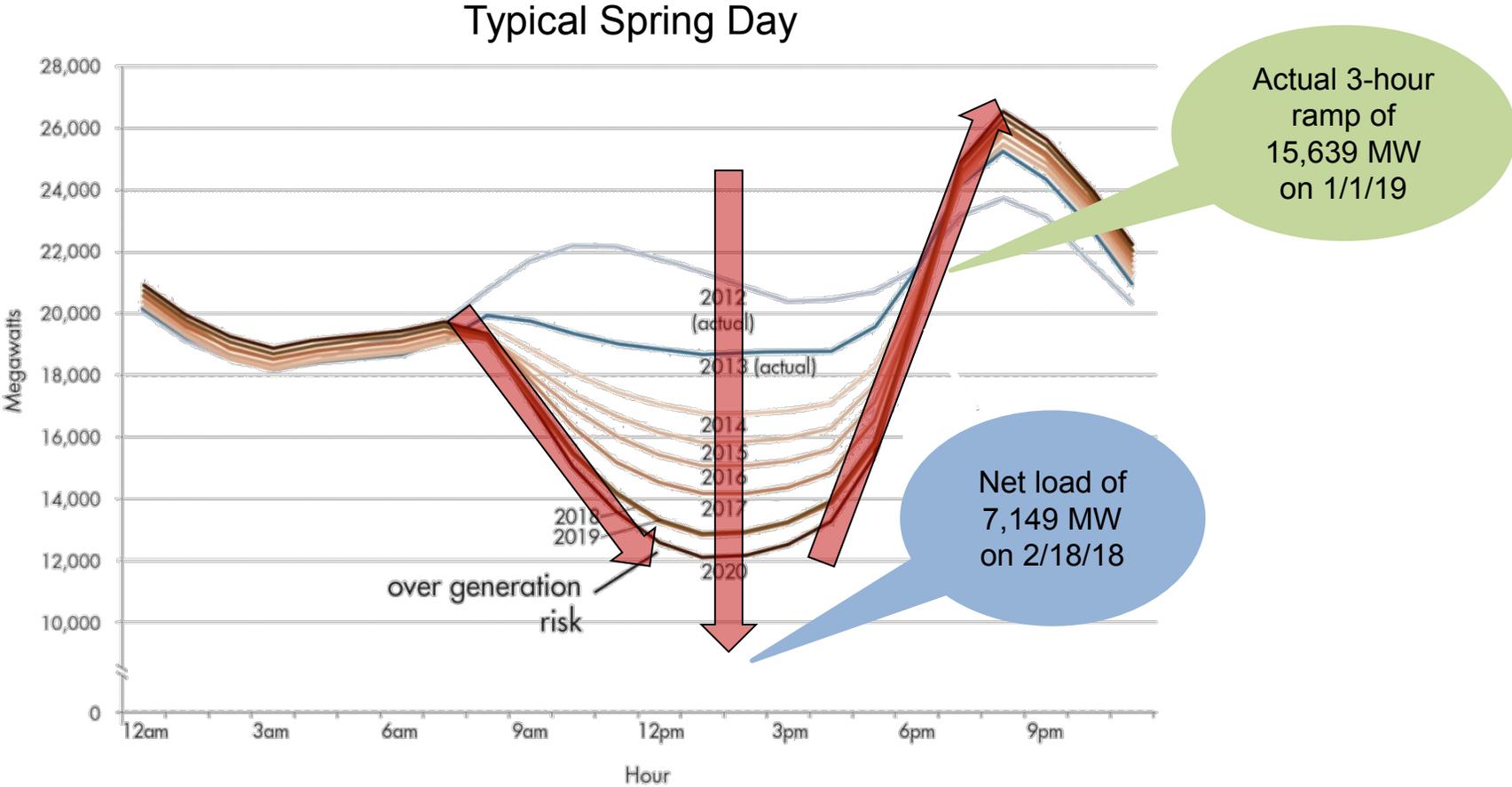
- Robust electric vehicles goal: 5.0 million by 2030, \$2.5B investment in new charging stations
- 10,000 MW of distributed generation by 2021; 1.3 GW of battery storage by 2024

**Decarbonization is creating opportunities to develop a high renewables and high DER energy service industry.**

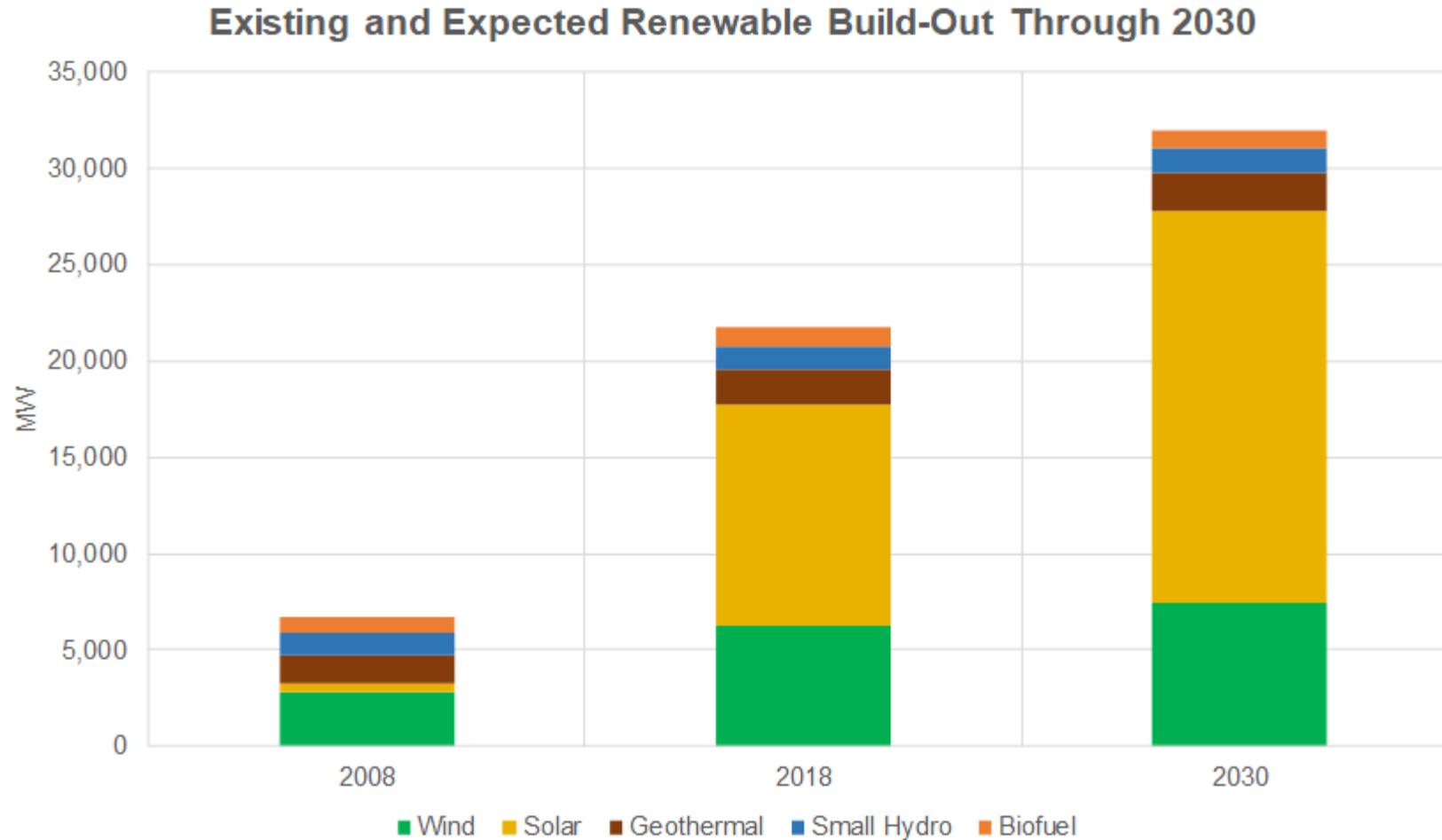
# Average demand curve: March 2008 vs. March 2018



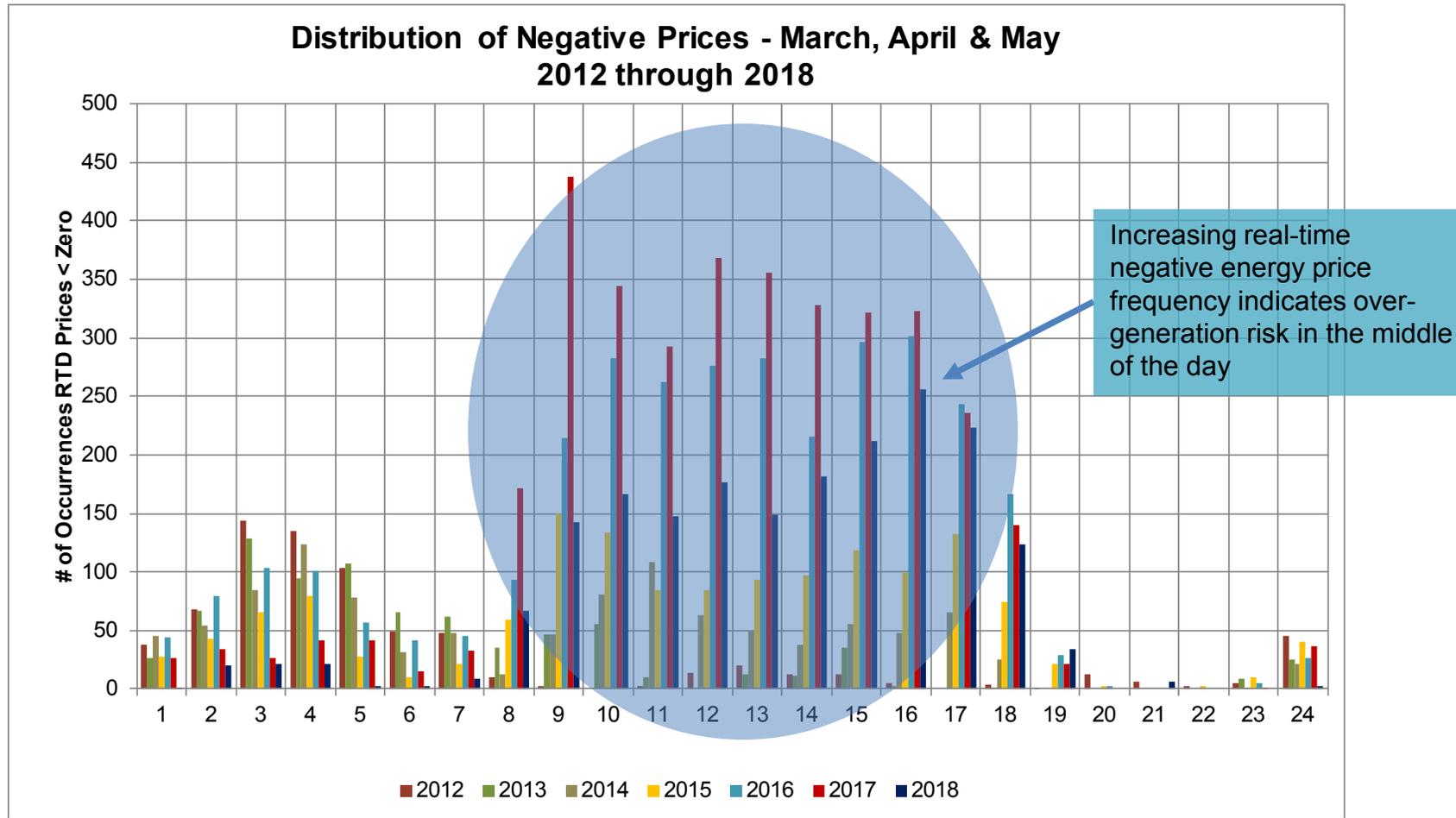
# The duck turns 10 years old: Actual results are approximately four years ahead of original estimates



# Growth of renewables to achieve 60% by 2030 is expected to be largely solar

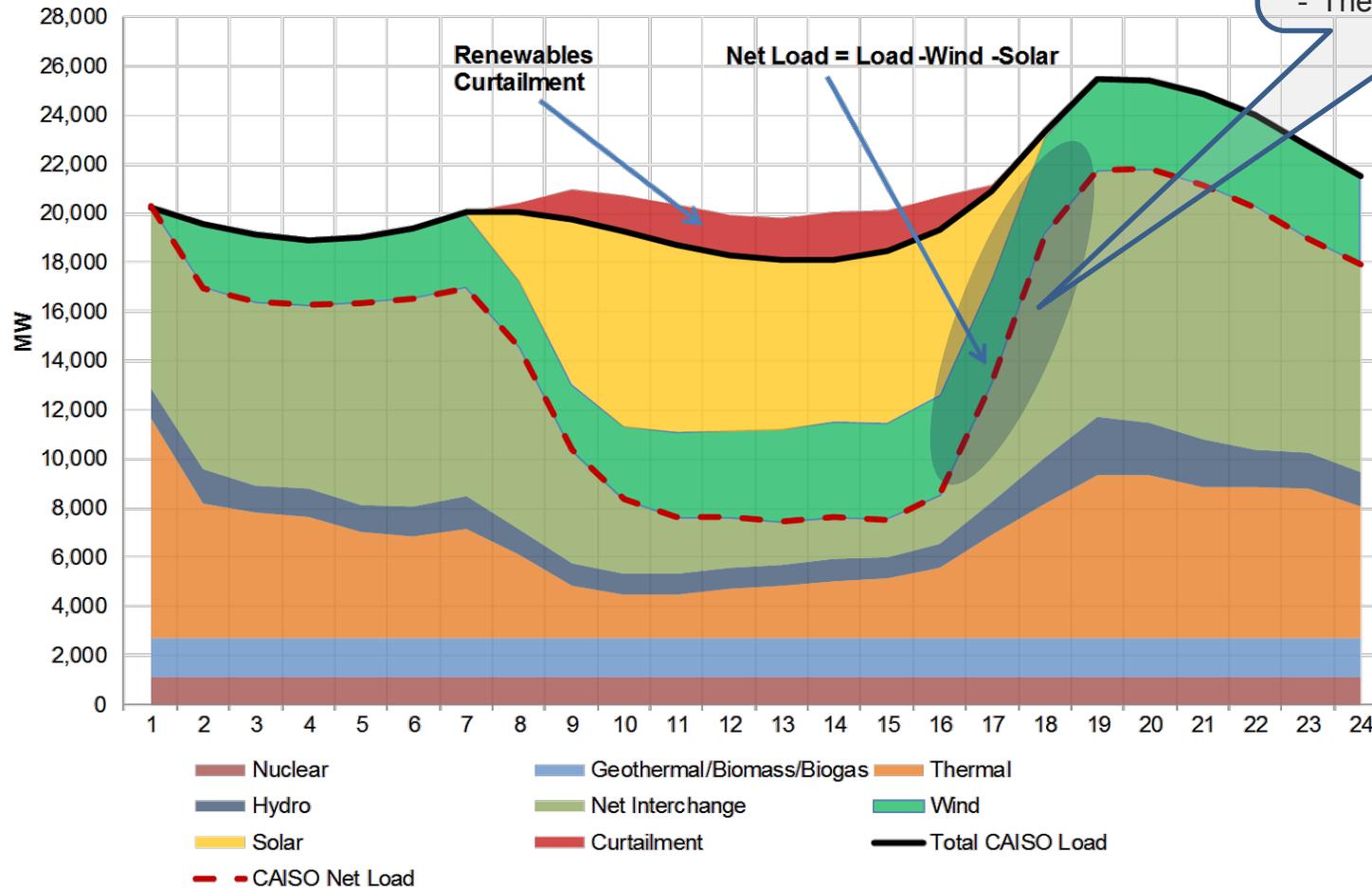


# New price patterns incentivize innovation in responsive demand and storage



# On Sunday, February 18, 2018, the ISO experienced a minimum net-load of 7,149 MW @ 14:06

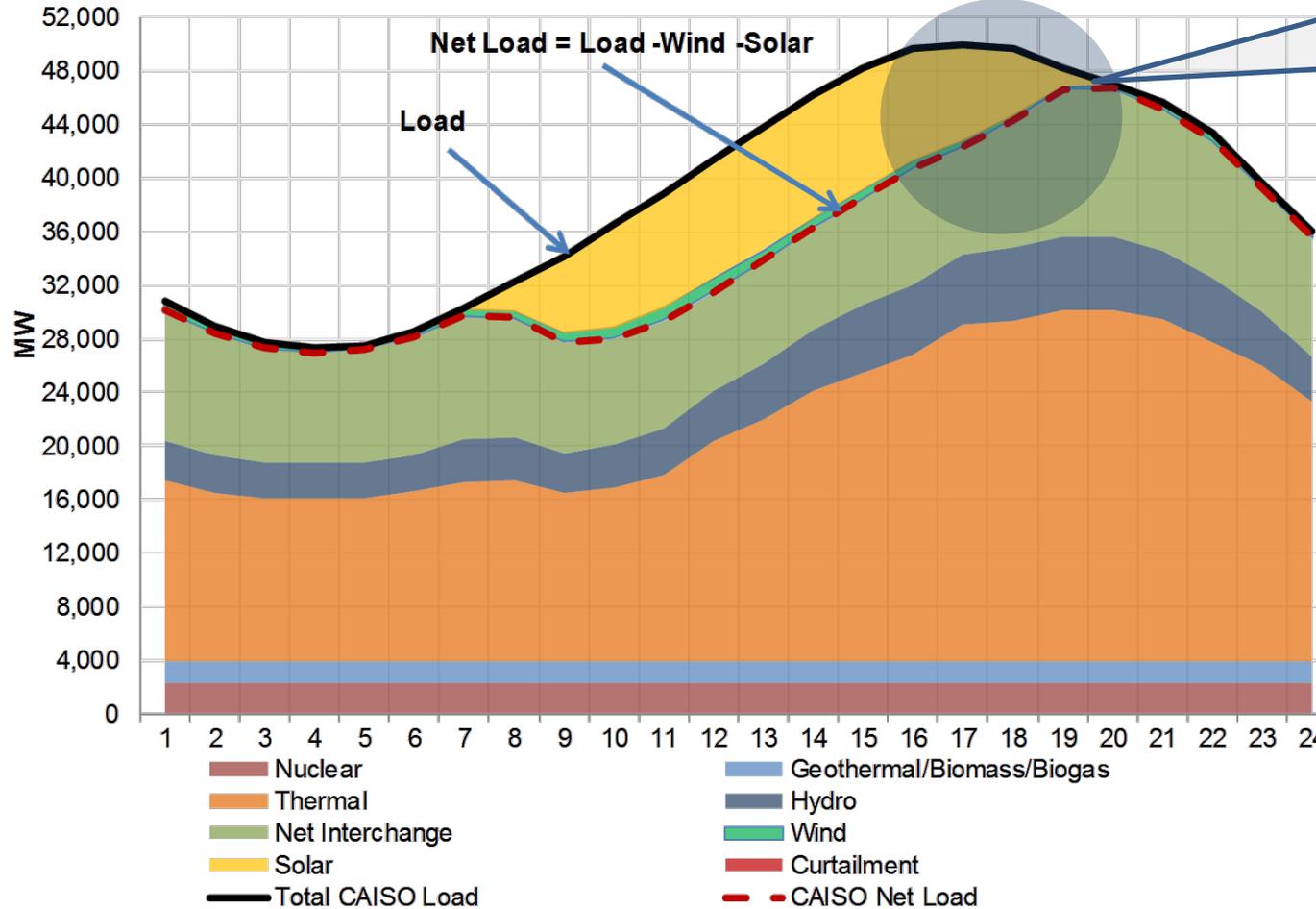
Generation Breakdown --- 02/18/2018



- Max renewables curtailed 1,905 MW
- Total curtailment was 9,070 MWh
- Max EIM Export was 2,338 MW
- Diablo Unit 2 was off-line
- One of the biggest challenges during low minimum net-load is the capability to commit internal resources to meet the evening ramp and other AS requirements
- Rely on imports on low net-load days to meet ramps

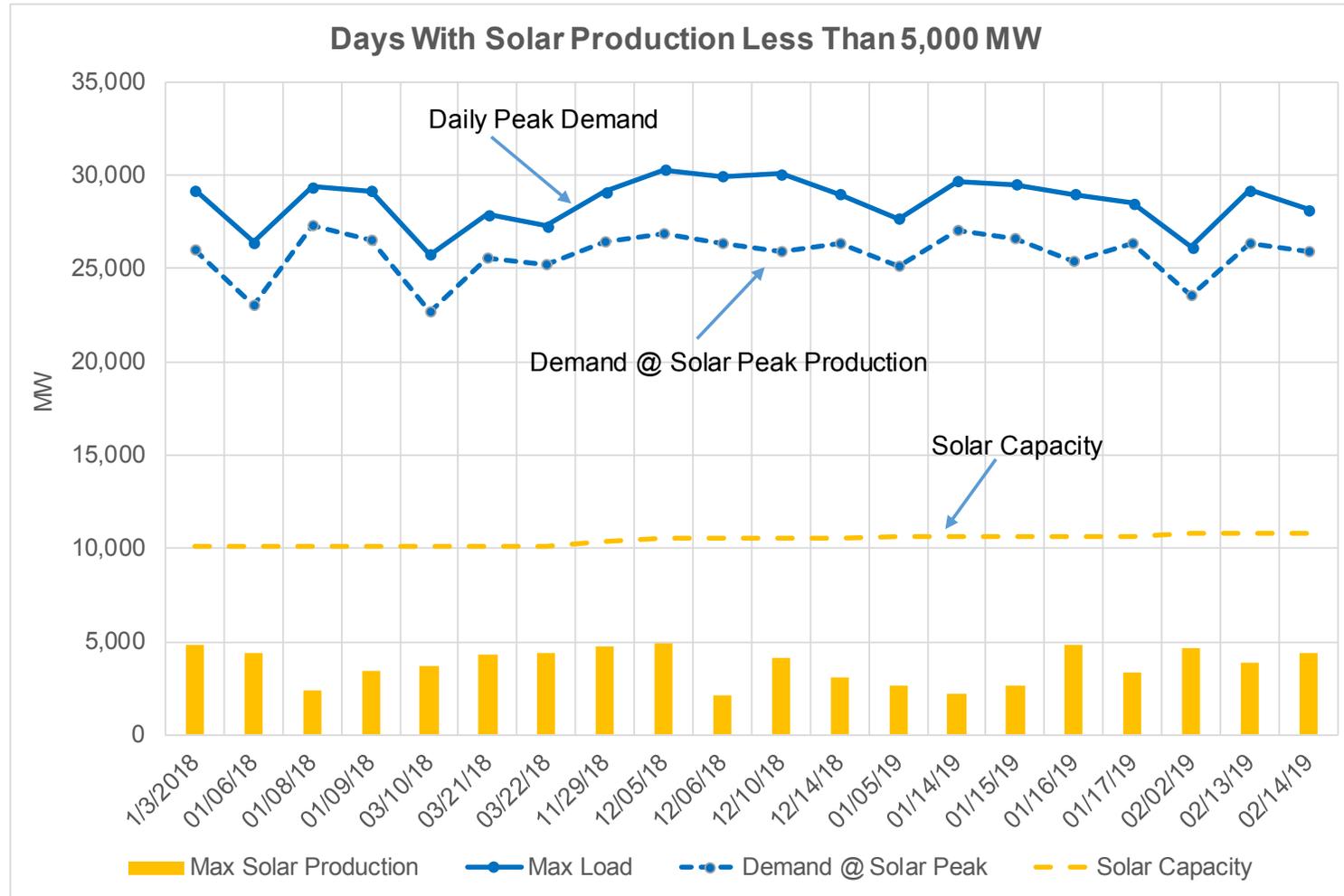
# In 2017, the CAISO peak load was 50,116 MW and occurred at 15:58:24 on Friday, September 1

Generation Breakdown --- 09/01/2017

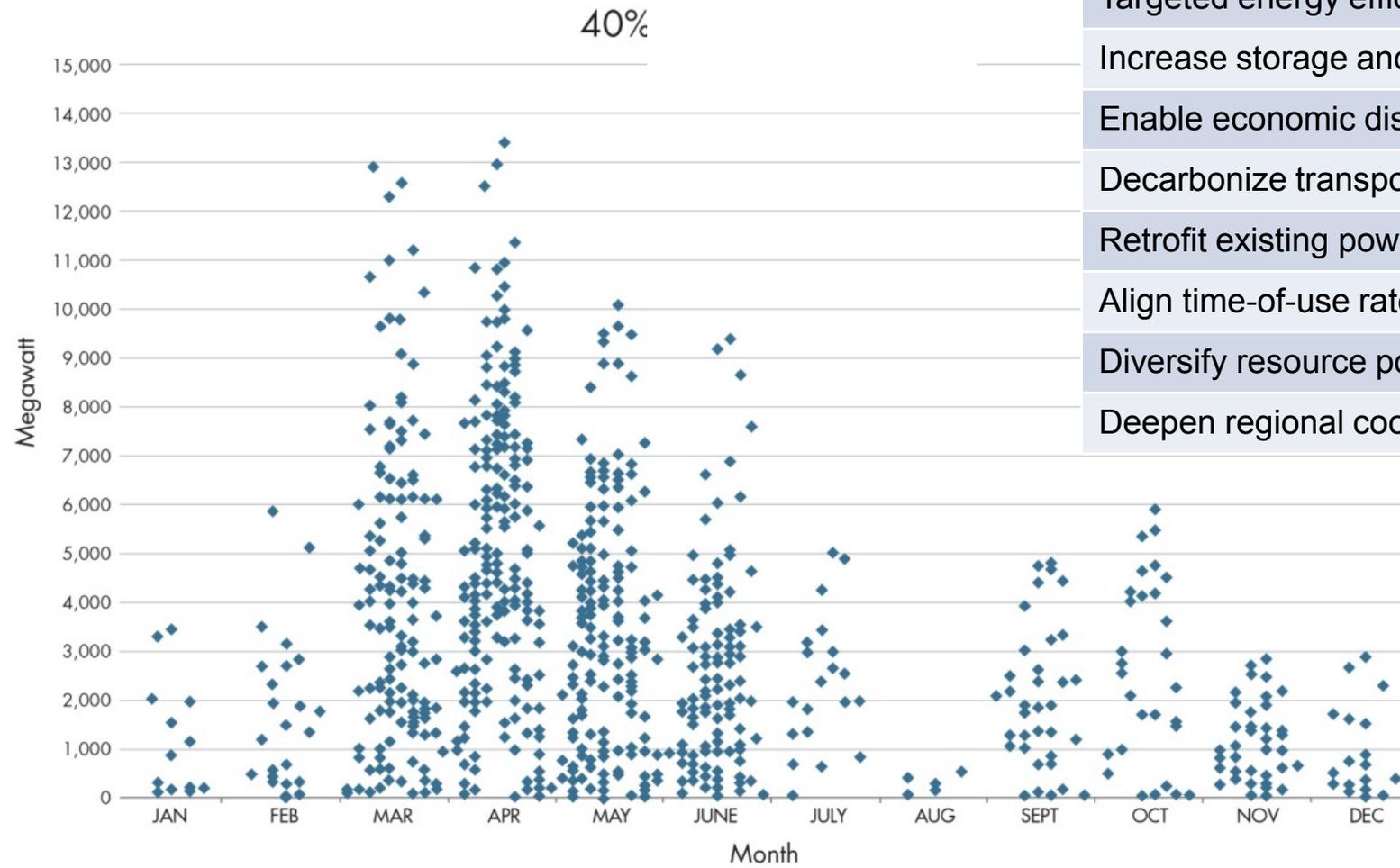


- High temperatures along the coast
- Peak Load: 50,116 MW
- Peak net-load: 47,168 MW
- Peak load decreased by 2,948 MW
- Solar production decreased by 7,199 MW
- Net Load increased by 5,301 MW
- Essentially no wind

# Days with solar production less than 5,000 MW

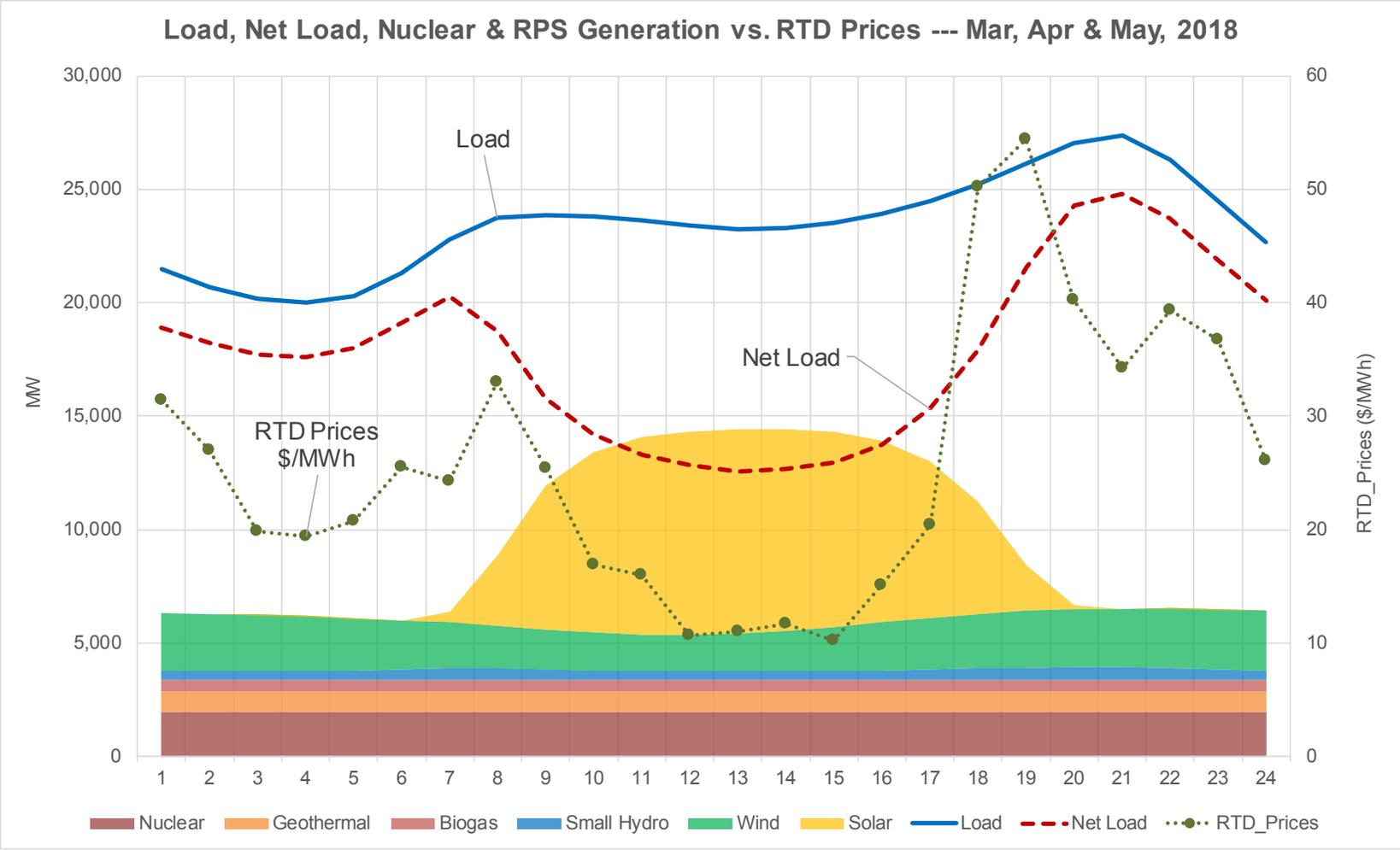


# Hourly renewable curtailment (blue dots) in 2024 at 40% RPS is significant



Solutions
Targeted energy efficiency
Increase storage and demand response
Enable economic dispatch of renewables
Decarbonize transportation fuels
Retrofit existing power plants
Align time-of-use rates with system conditions
Diversify resource portfolio
Deepen regional coordination

# CAISO's potential opportunities to utilize storage devices during the spring months



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