CCA Markets, RA, Risk

Pradeep Gupta

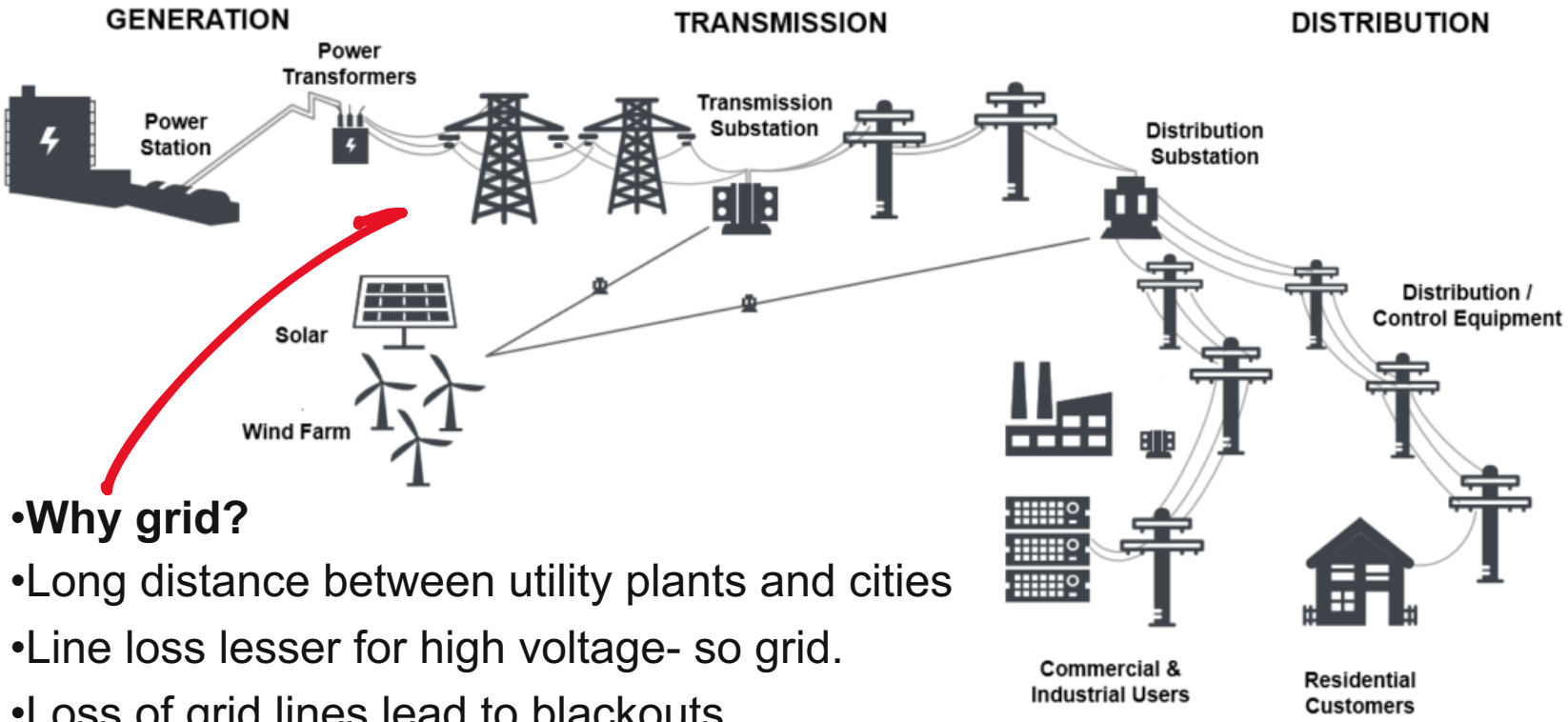
October 25, 2019

Peninsula Clean Energy

Current Concerns

- Wildfire Utility Issues
- System Reliability/Resource Adequacy
- Distributed Energy Resources (DER)
- A Review of Markets, Reliability and Risk Management

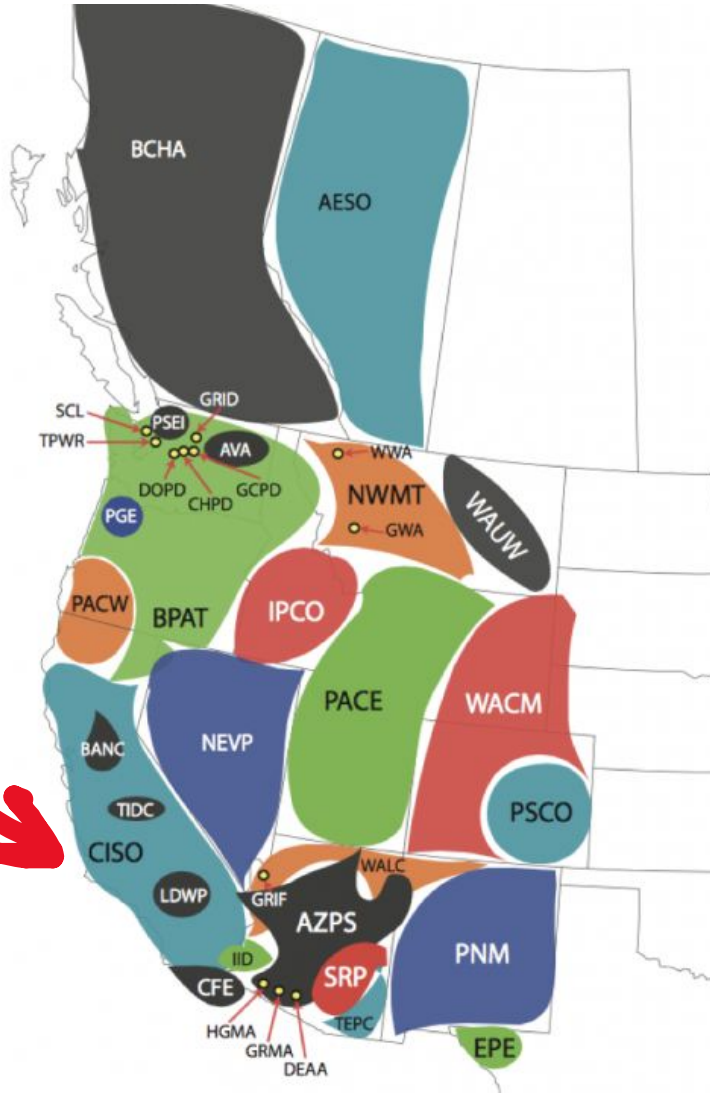
Power Industry



- **Why grid?**
- Long distance between utility plants and cities
- Line loss lesser for high voltage- so grid.
- Loss of grid lines lead to blackouts
- **MICROGRID OPTION**

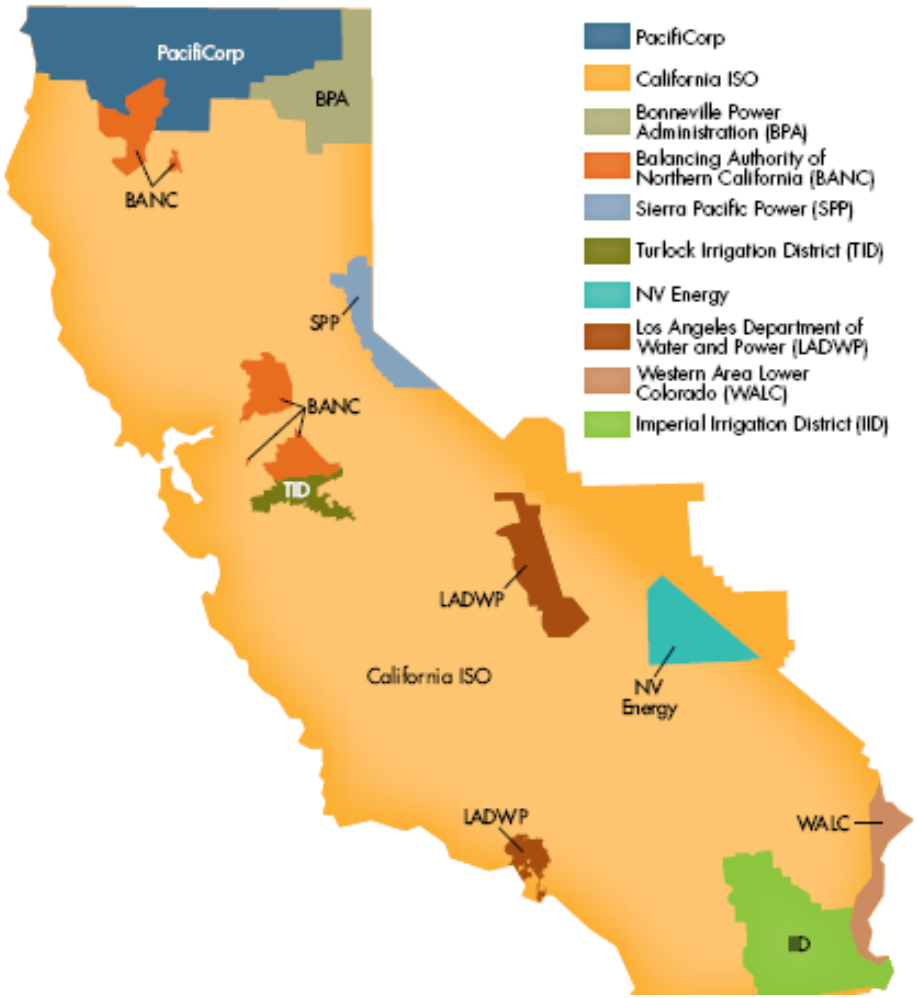
Western Electricity Coordinating Council (WECC)

- Western Interconnection
  - Multiple BAAs
- **Balancing Authority Area (BAA)**
  - Maintain Supply/Demand Balance
    - Demand = Supply + Imported Energy
  - Manage Inter-Tie Tagging
  - Manage System Frequency
  - Manage Coordinated Dispatch of Generation



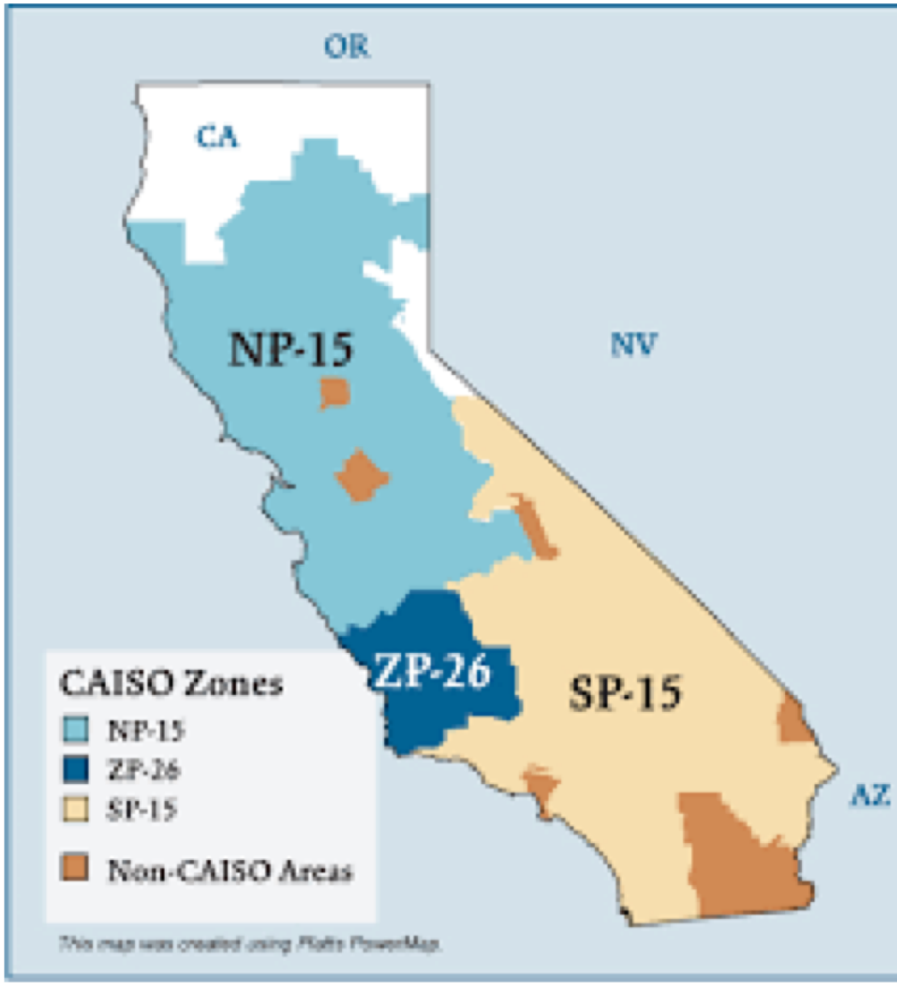
8 California Balancing Authority Areas

- CAISO BAA
  - 45,000 MW
  - 26,000 circuit miles
  - Wholesale Power Market
  - Reliable Operations
  - Grid Planning



How CAISO Manages Grid

- Real-time balancing of supply (generating resources) and demand (load) to ensure grid reliability
- Manages transmission grid and operates power market
- Trading hubs: aggregated pricing nodes corresponding to CAISO transmission zones
- NP-15 and SP-15 are actively traded delivery points in the wholesale power market



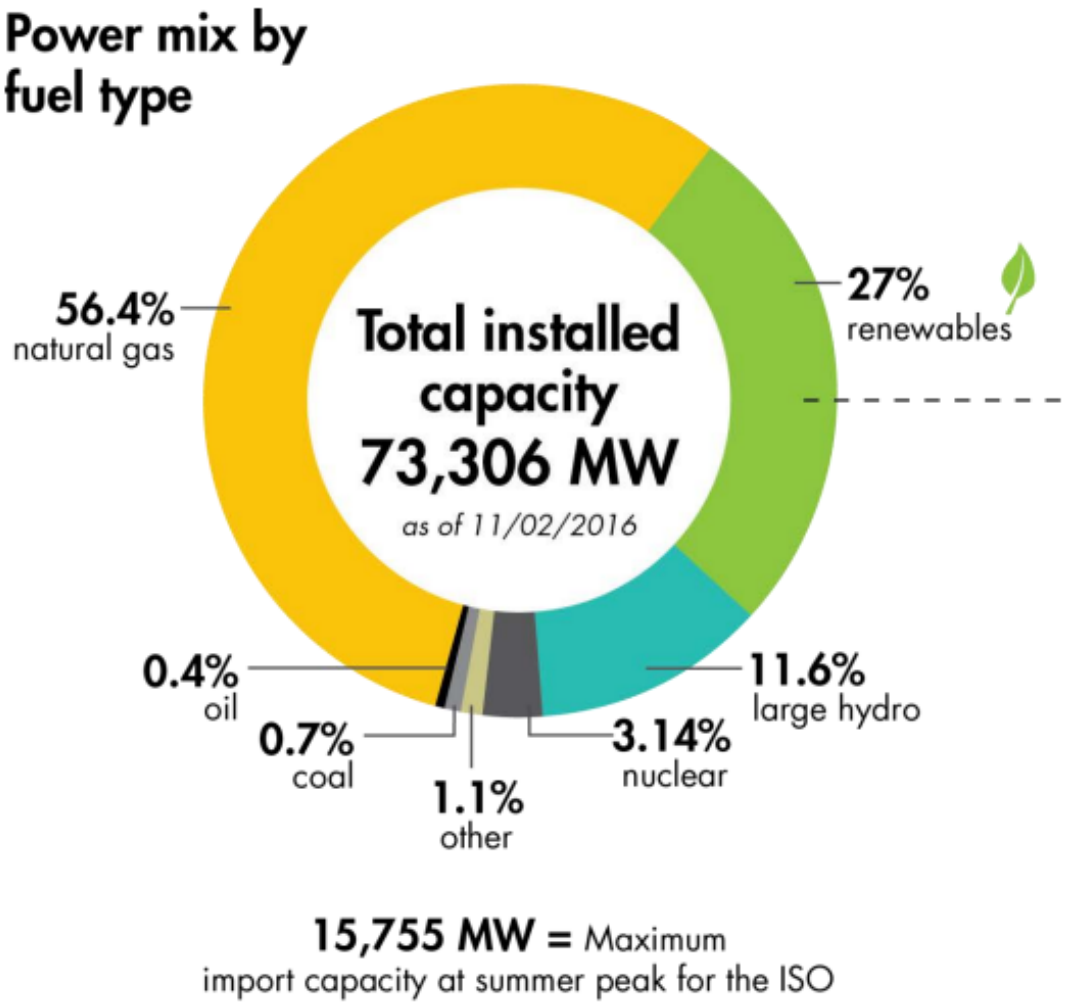
PENINSULA CLEAN

Energy

- Transacting Energy
  - Bilateral Wholesale Markets
  - CAISO Day-Ahead Market
  - CAISO Real-Time Market
- Physical / Financial Transactions
- Inter-SC Transactions

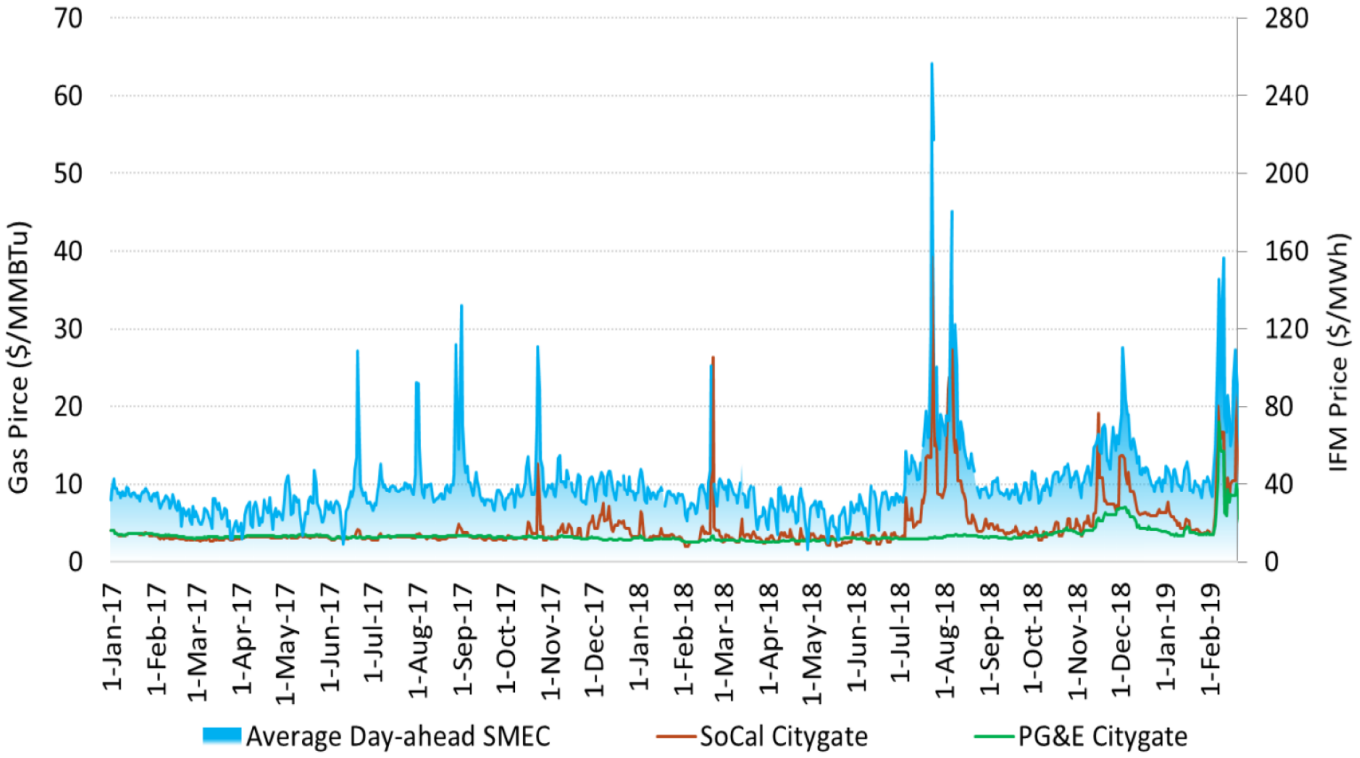
Energy Market Price Volatility

- Key Drivers of Energy Market Prices
  - Natural Gas
    - Storage
    - Transport
    - Demand
  - Weather
    - Local and Regional
  - Hydrology
  - Policy and Changing Supply Composition
    - RPS
    - GHG Free Objectives


Power mix by fuel type
56.4%
natural gas
Total installed capacity
73,306 MW
as of 11/02/2016
27%
renewables
0.4%
oil
0.7%
coal
1.1%
other
3.14%
nuclear
11.6%
large hydro
15,755 MW = Maximum
import capacity at summer peak for the ISO

Natural Gas Drives Power Market Prices

Figure 21: Trend of gas and electric prices in the day-ahead market



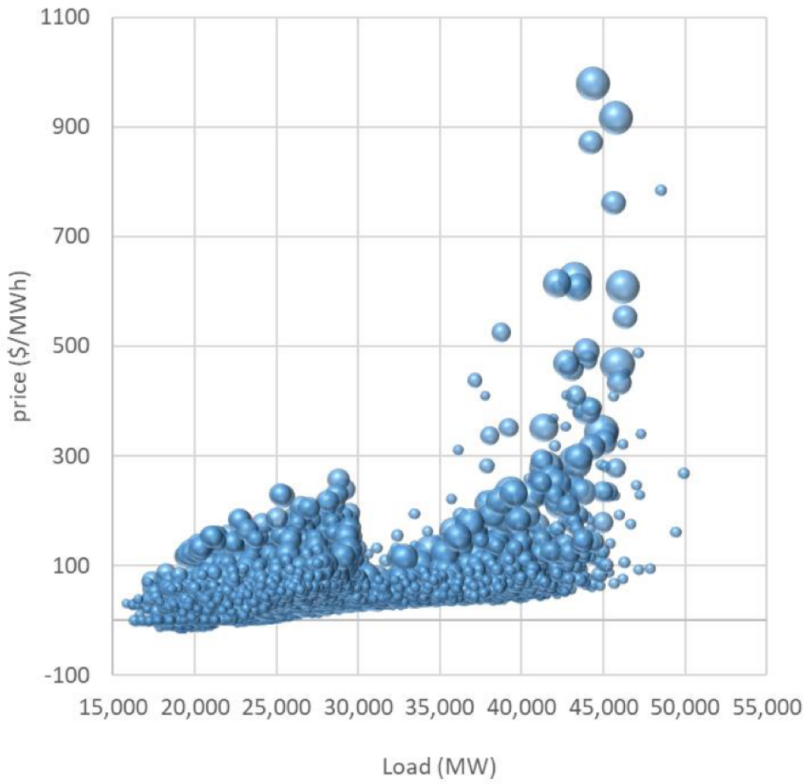
MEC: Power price – System marginal energy component

ırce: CAISO Price Performance in the CAISO Energy Markets; June 2019

Weather Drives Power Market Prices

- High system load, generally associated with heat waves, is correlated with higher electricity market prices

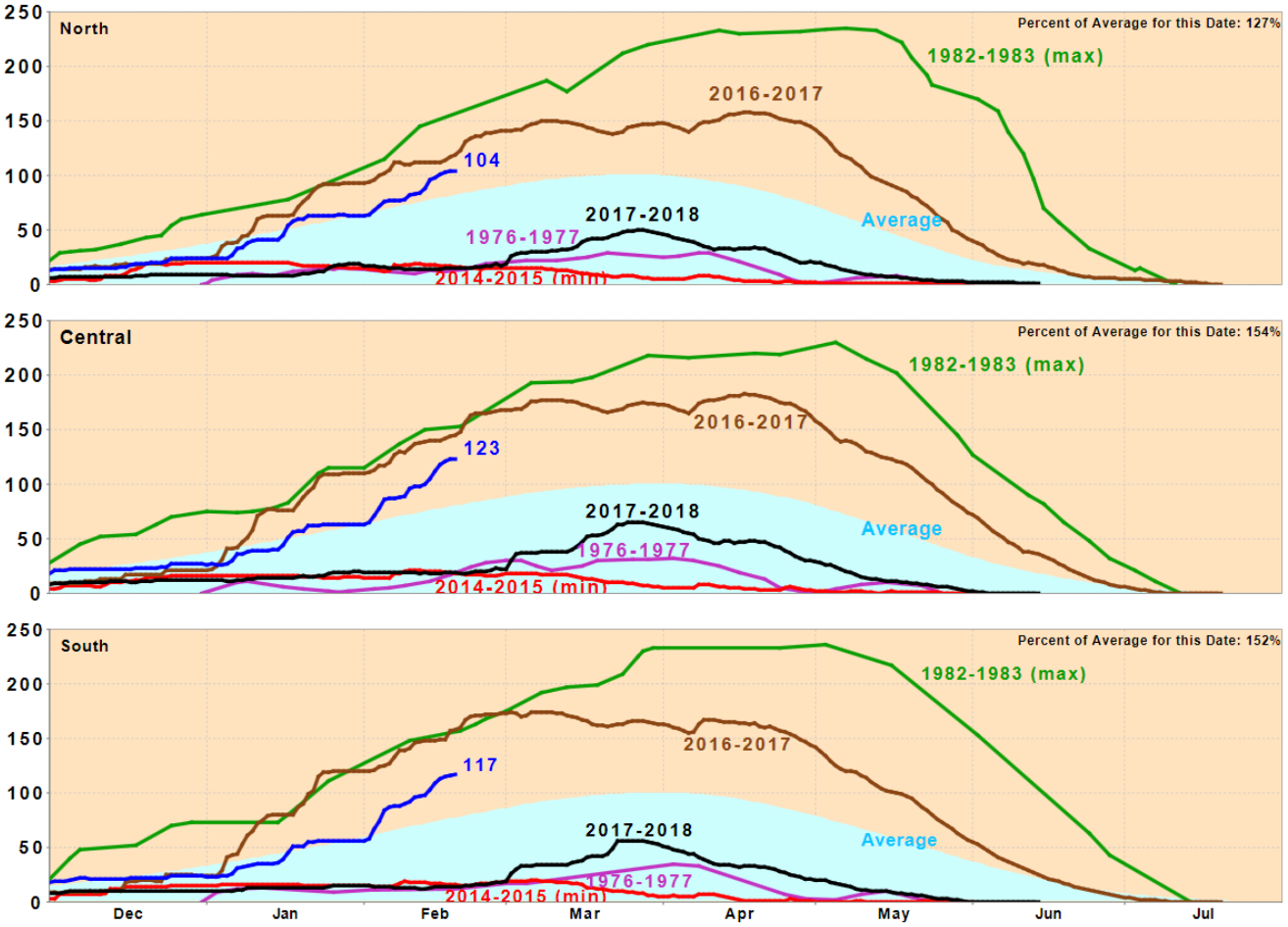
Figure 36: Day-head prices correlated to demand level



CAISO Price Performance in the CAISO Energy Markets; June 2019

Hydrology Forecast

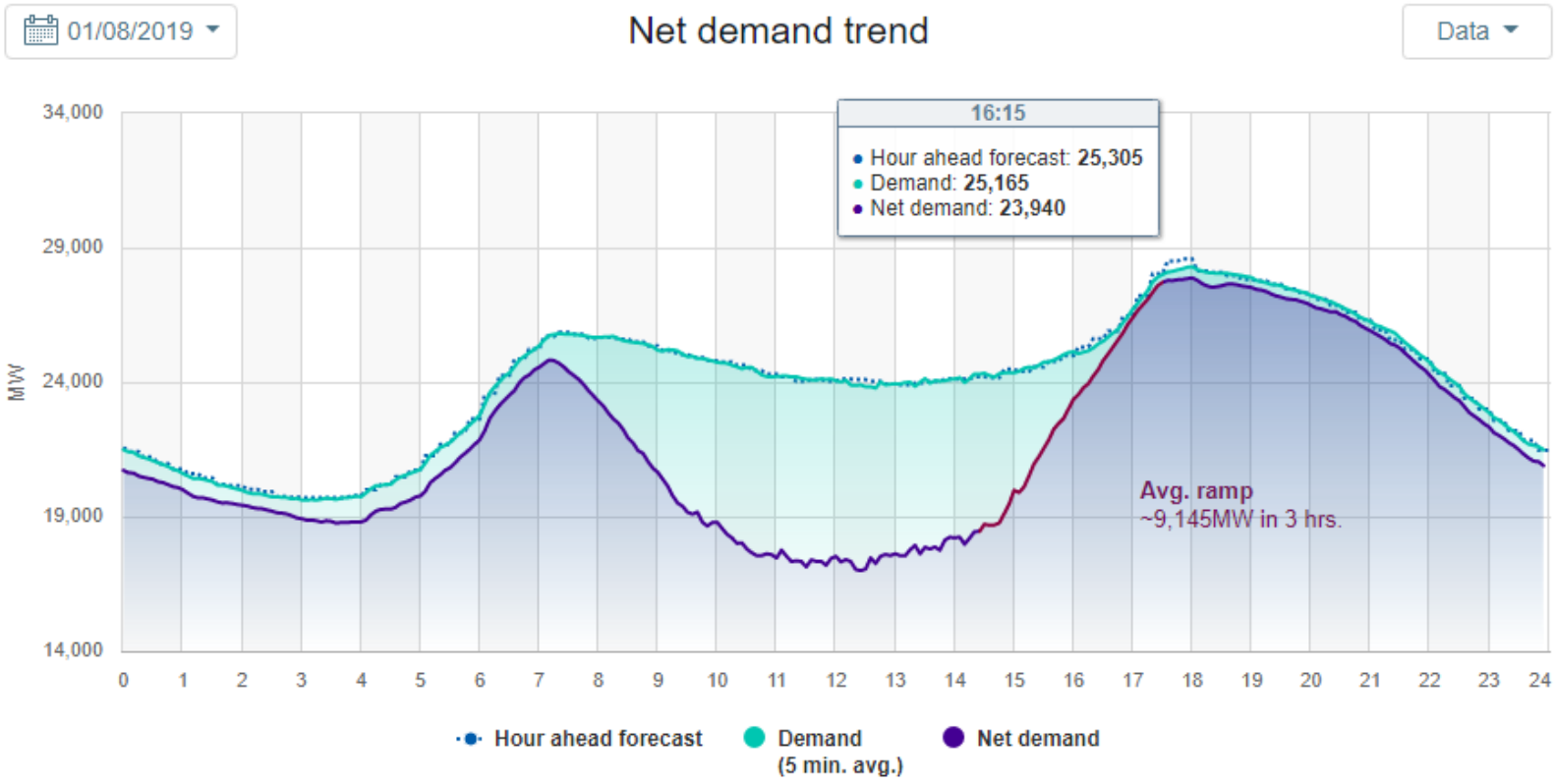
California Snow Water Content, February 19, 2019, Percent of April 1 Average



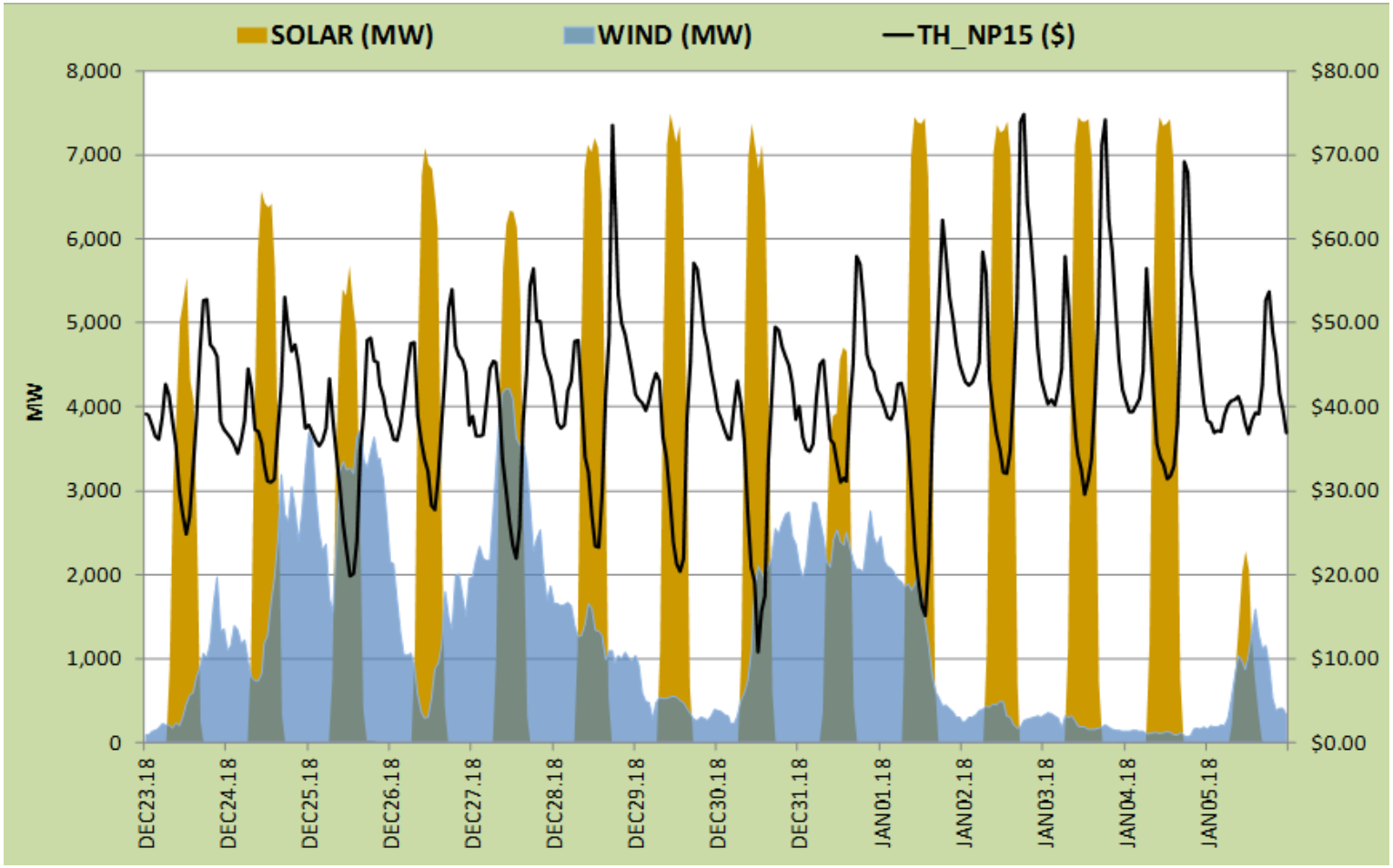
Statewide Percent of April 1: 116%

Statewide Percent of Average for Date: 146%

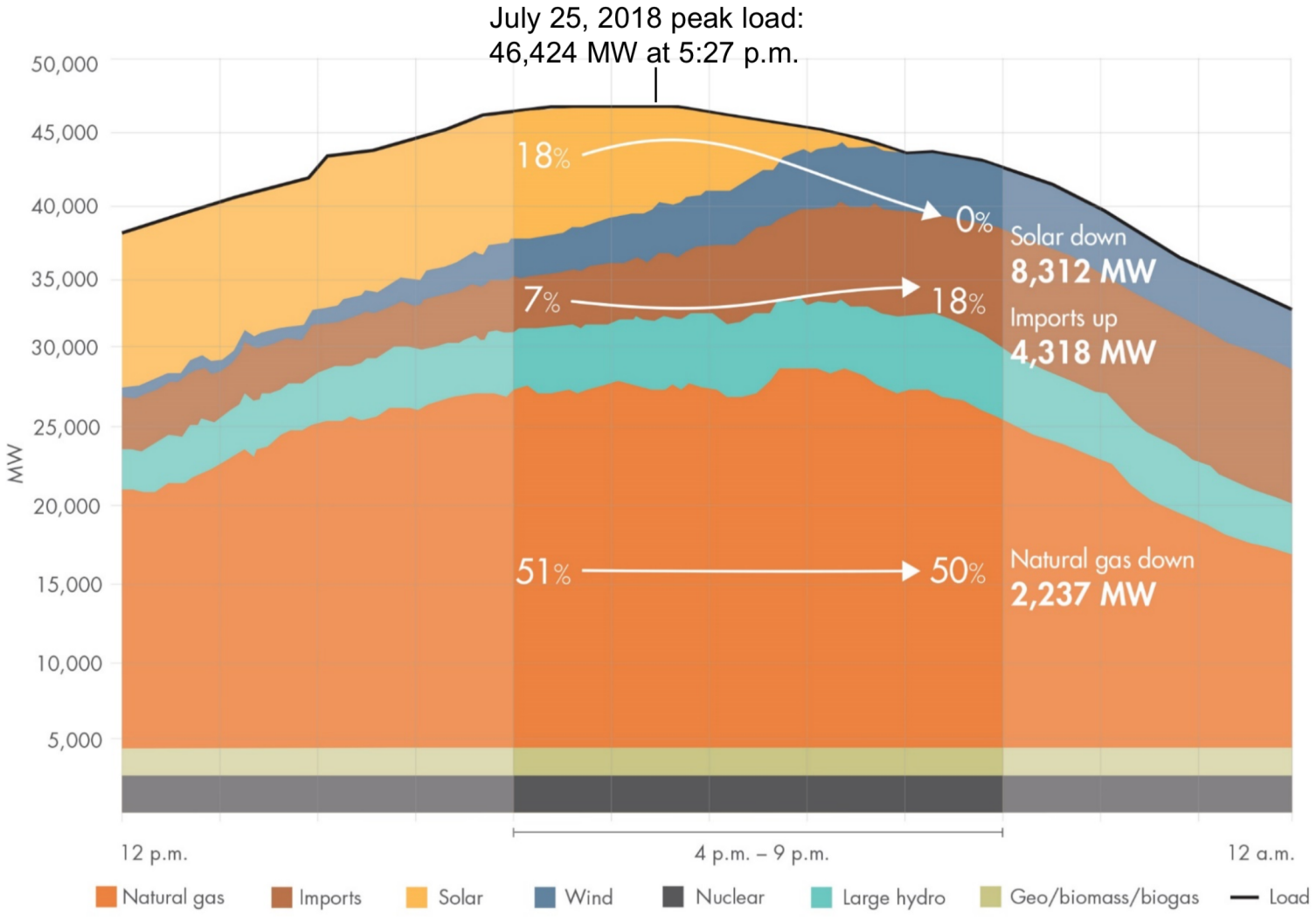
Integration of Renewables



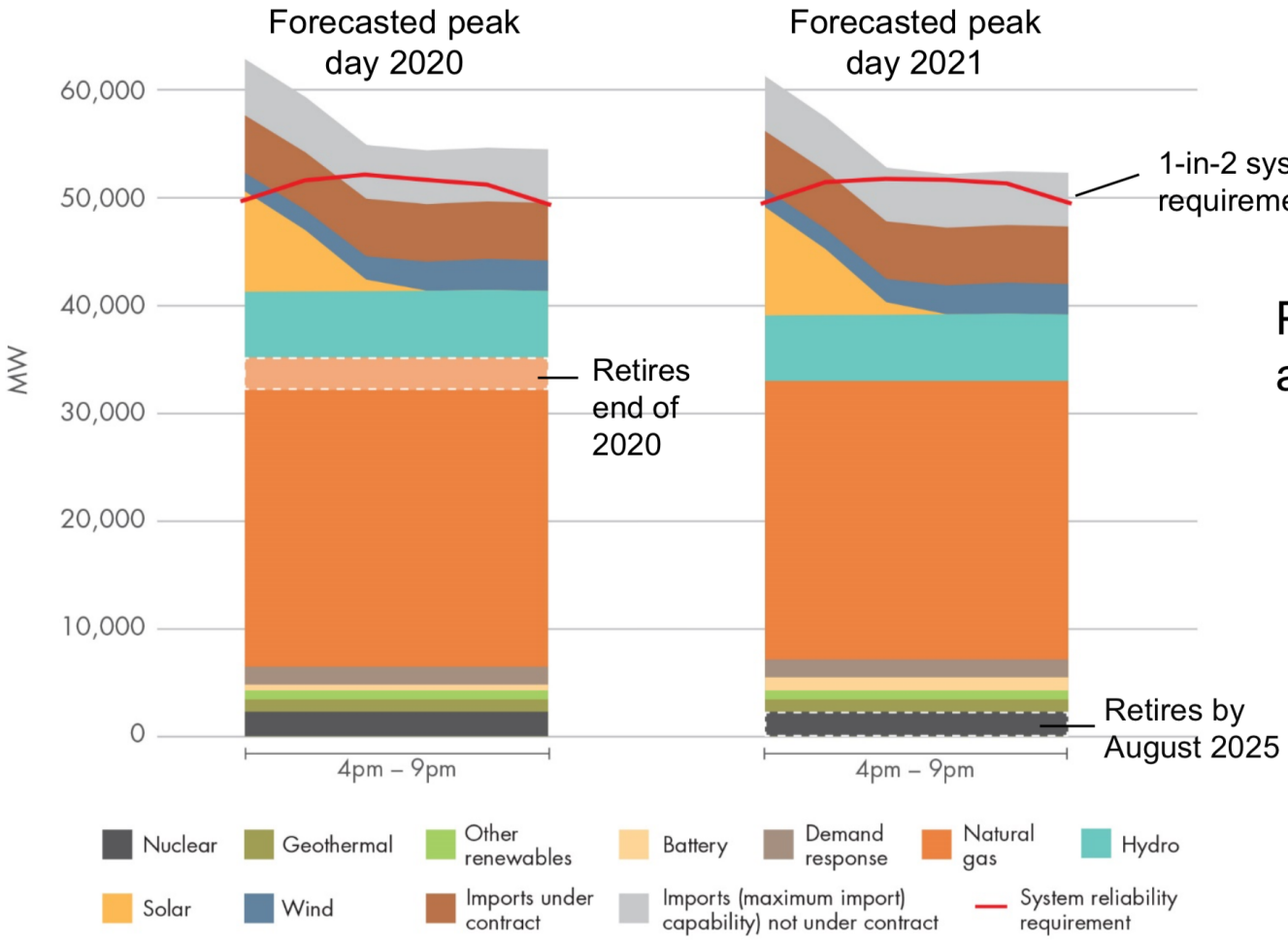
Impact of Solar / Wind on Energy Prices



Gas and imports support high loads after sun sets



Potential resource shortage[1] starting in 2020



Projected shortfalls at 7 p.m.:

2020 = **2,300 MW**

2021 = **4,400 MW**

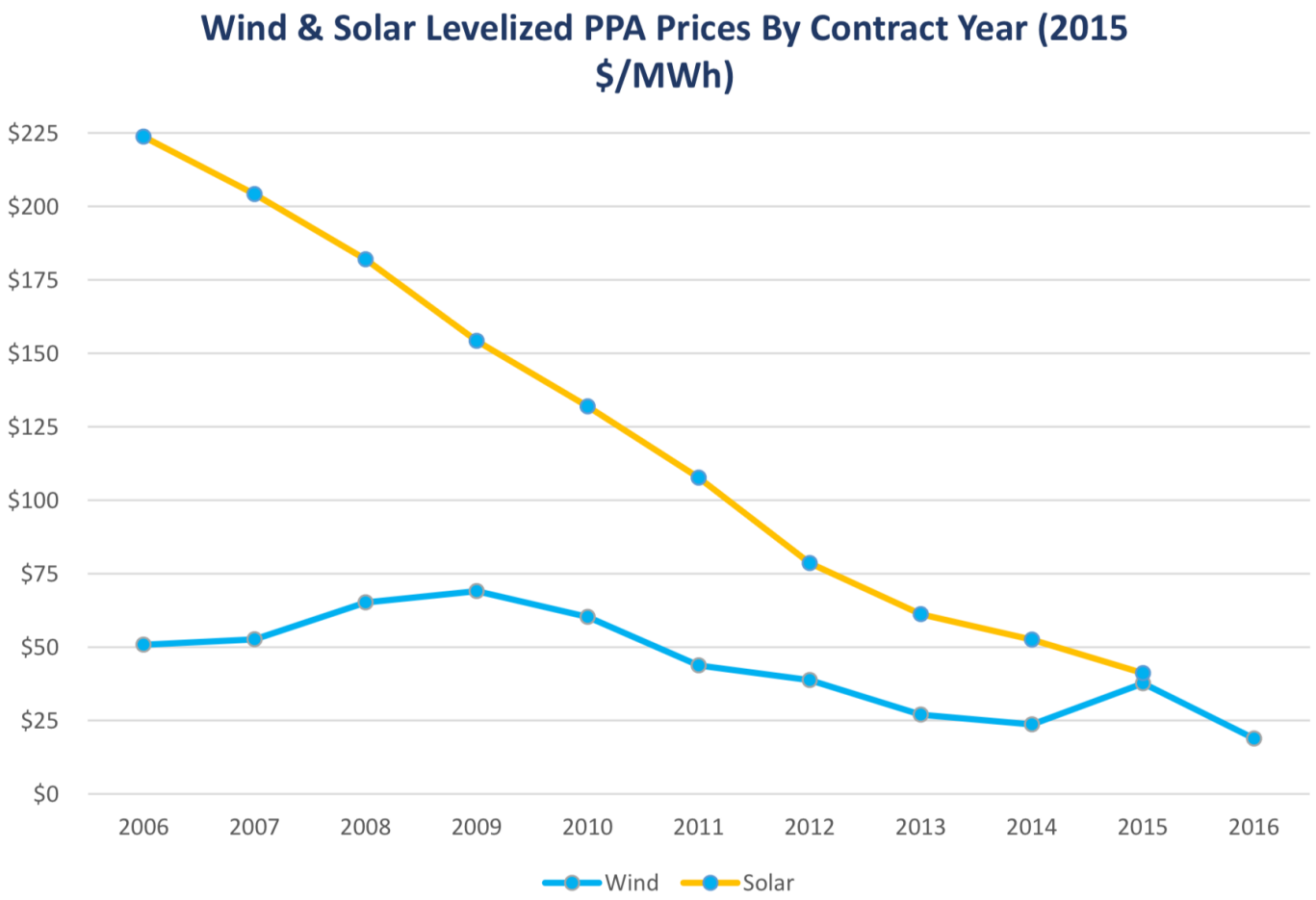
2022 = **4,700 MW**

[1] Assumes no transmission outages or other significant events affecting availability of generation

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

Wind & Solar PPA Prices



Credit: LBNL, "Utility Scale Solar 2015" and "2015 Wind Technologies Market Report"

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

Hedging Strategies

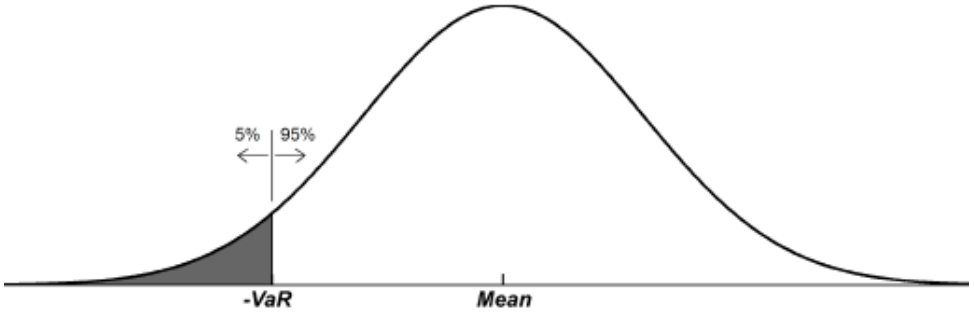
- Changing market = more volatility in prices
- Hedging limits PCE's exposure to market prices
- 2 types of hedges:
  - Financial Hedge
  - Renewable Power Purchase Agreement (PPA)
- Conduct procurements on a quarterly basis

Hedge Target Levels

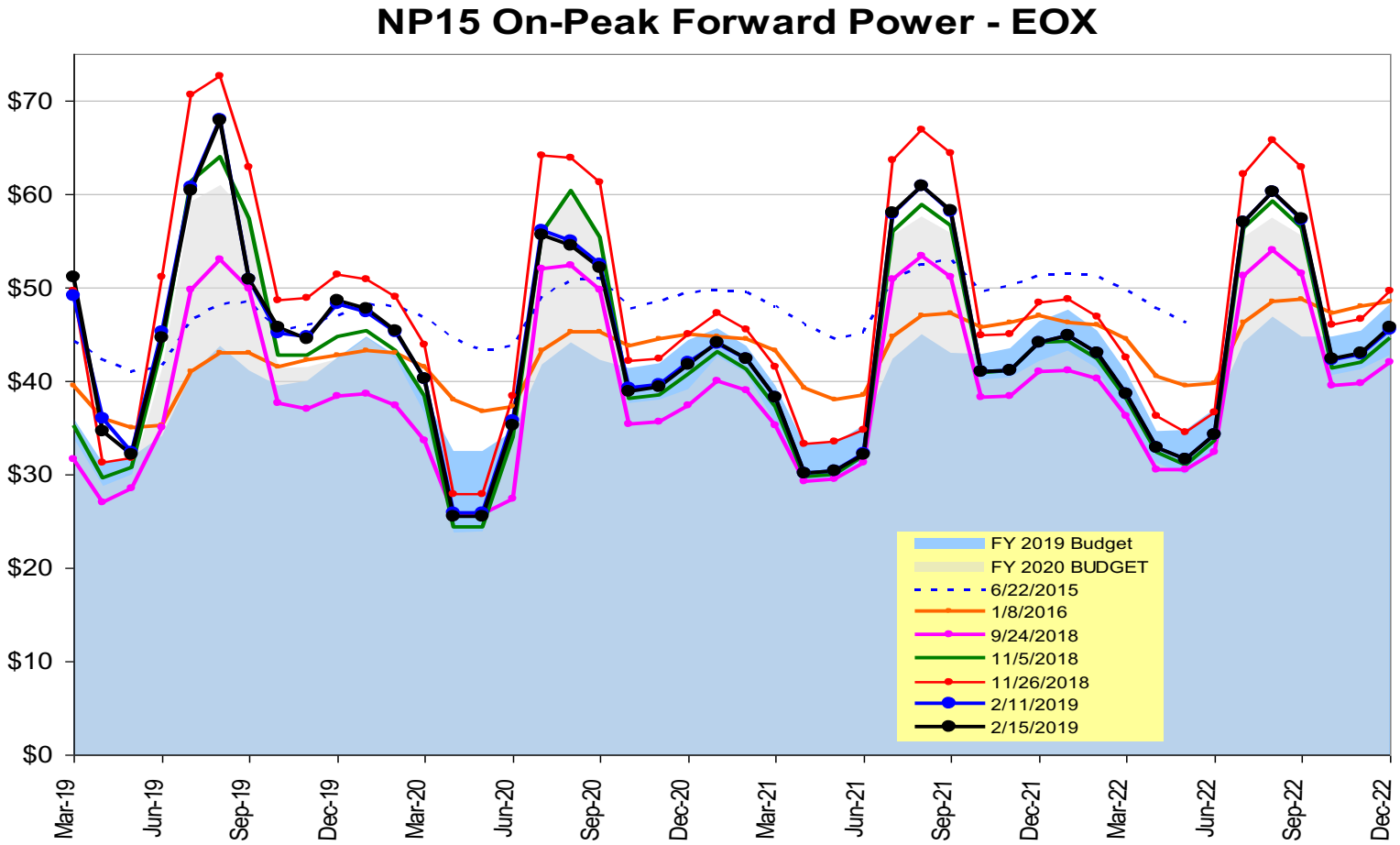
	% of Load Procured	
	Min	**Max**
Current Year	90%	100%
Year 2	75%	90%
Year 3	65%	80%
Year 4 and Beyond	55%	70%

Example of Hedging Tools

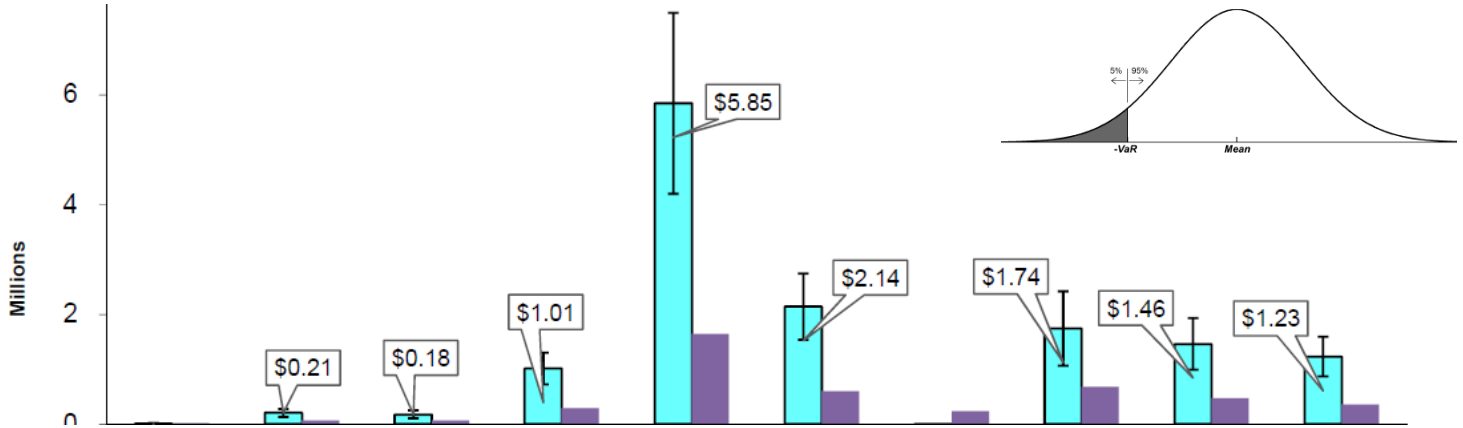
- Inter-SC Trade of Energy
  - Tool used to fix the costs of energy supply
    - All Hours (7 X 24)
    - On-Peak Delivery (HE 07 to HE 22)
    - Off-Peak Delivery (HE 01 to HE 06 & HE23/24)
    - Shaped DeliveryImports / Exports
- Options
- Generation Resource



Forward Energy Curve



- MWh Coverage and Value-at-Risk Hedging
  - Match Demand with Fixed Price Supply
    - Reduces exposure to market price volatility
    - Form of Insurance
      - May include premium cost similar to insurance
  - Establish Coverage within Risk Tolerance
    - Maintain open position based on value-at-risk
    - Value-at-risk is a measure of risk of loss



Resource Adequacy

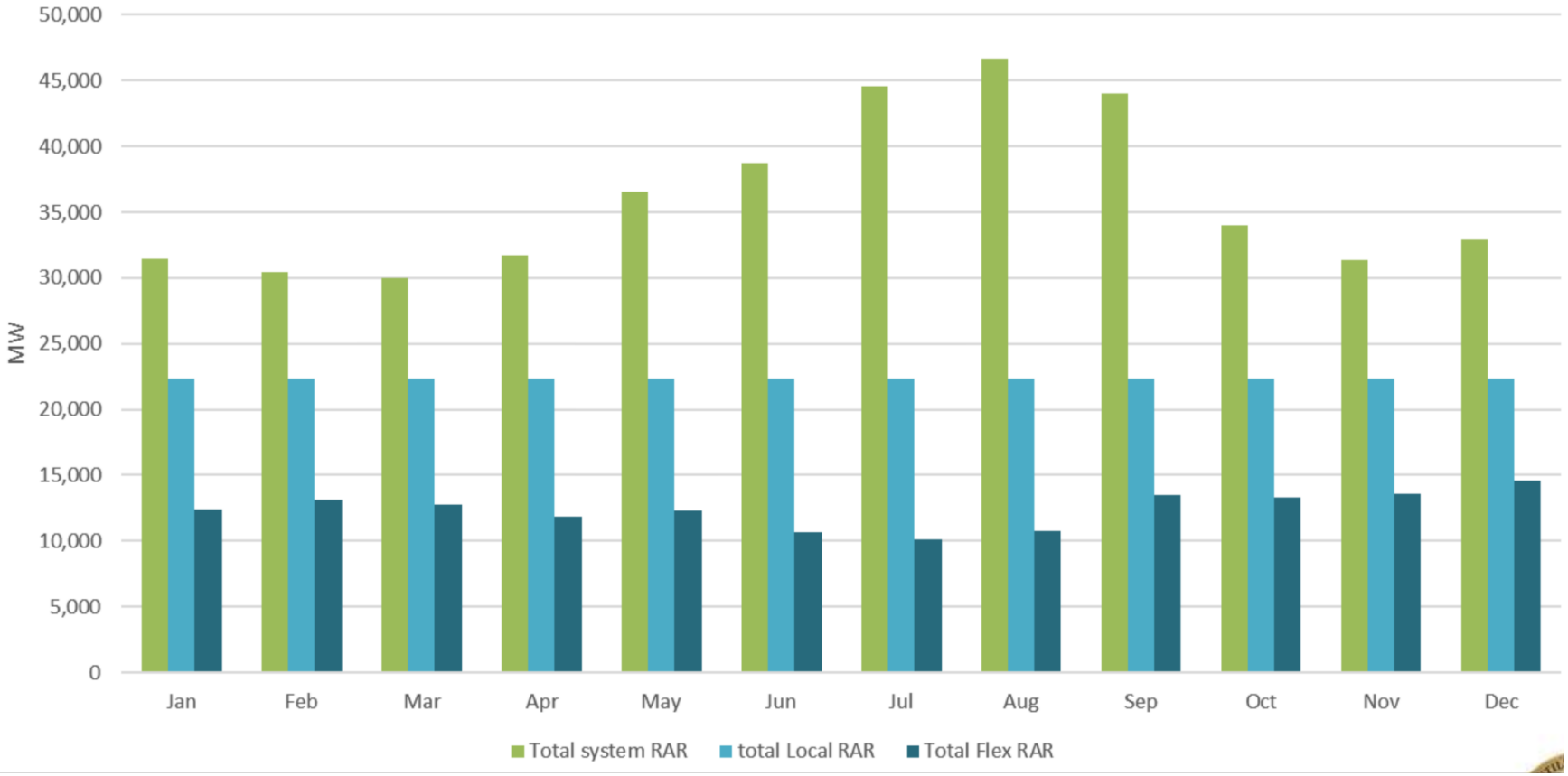
Current Wholesale Markets Designs

- Clear supply and demand at the marginal cost of supply, while maintaining the reliability of the system.
- Current wholesale market designs have been challenged in providing adequate financial incentives to support efficient entry.
- This in turn has led to the development of “resource adequacy,” pricing mechanism.

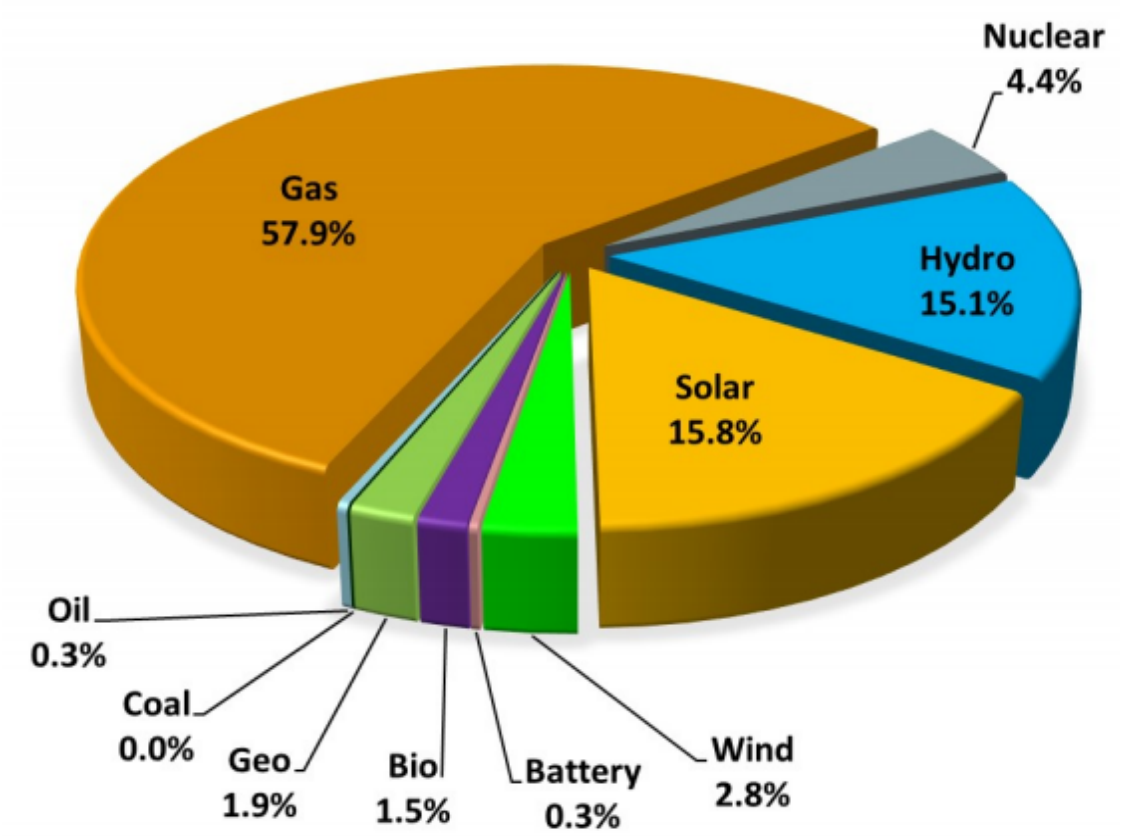
RA Program

- Resource Adequacy Requirements
  - Load Serving Entities (LSE) must demonstrate they have purchased a defined amount of capacity
- System Resource Adequacy
  - **115% of LSE monthly peak-demand**
  - Supplied from qualified resources
    - Net Qualified Capacity
- Local Resource Adequacy
  - **Capacity located in specific geographic locations**
  - Sub-requirement (% of overall capacity must be local)
- Flexible Resource Adequacy
  - **Capacity with defined operational characteristics**
  - Sub-requirement (% of overall capacity with ramping)

2018 RA Requirements (CPUC LSEs)



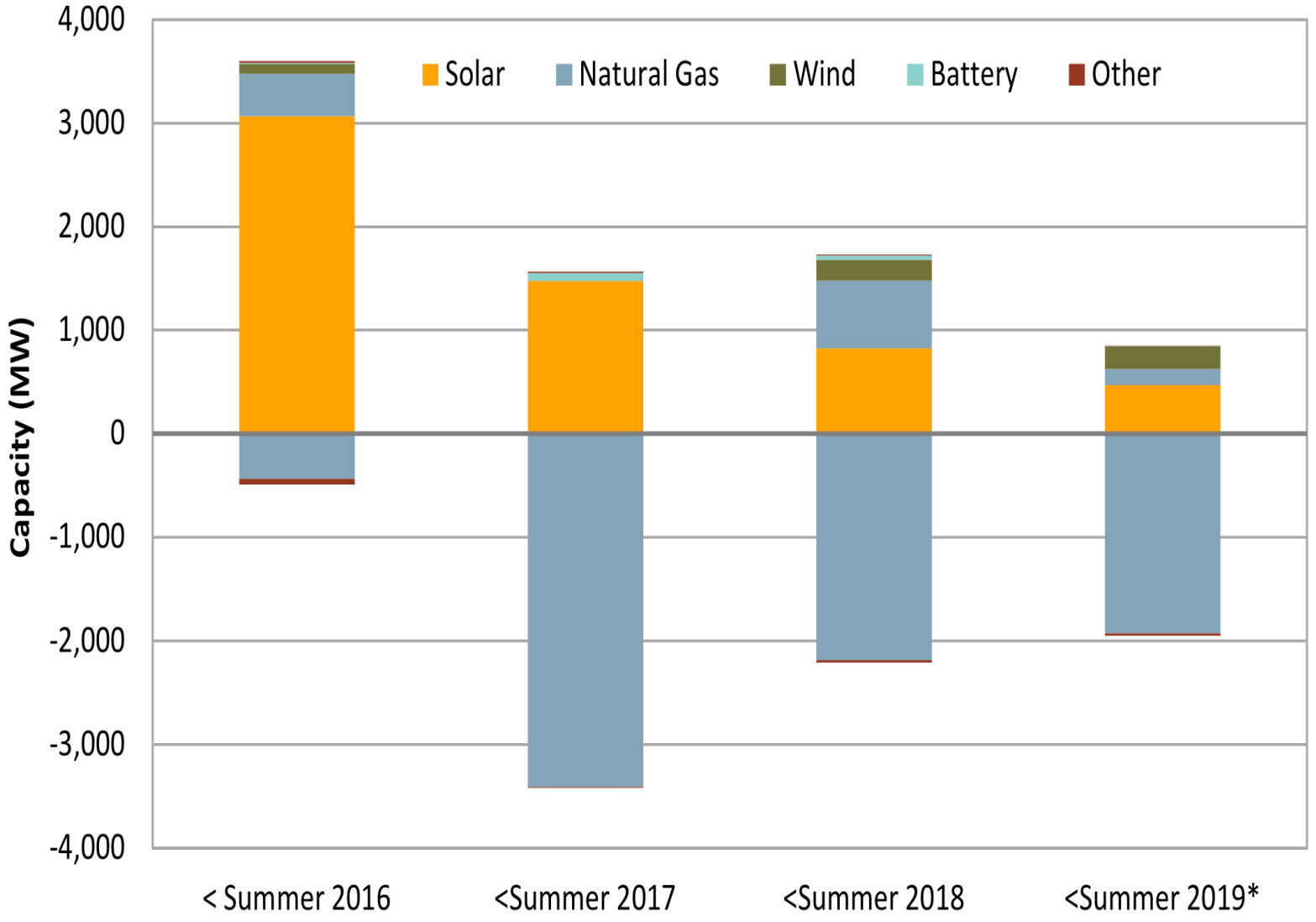
2018 ISO SUMMER ON-PEAK NQC BY FUEL TYPE



Tightening RA Markets

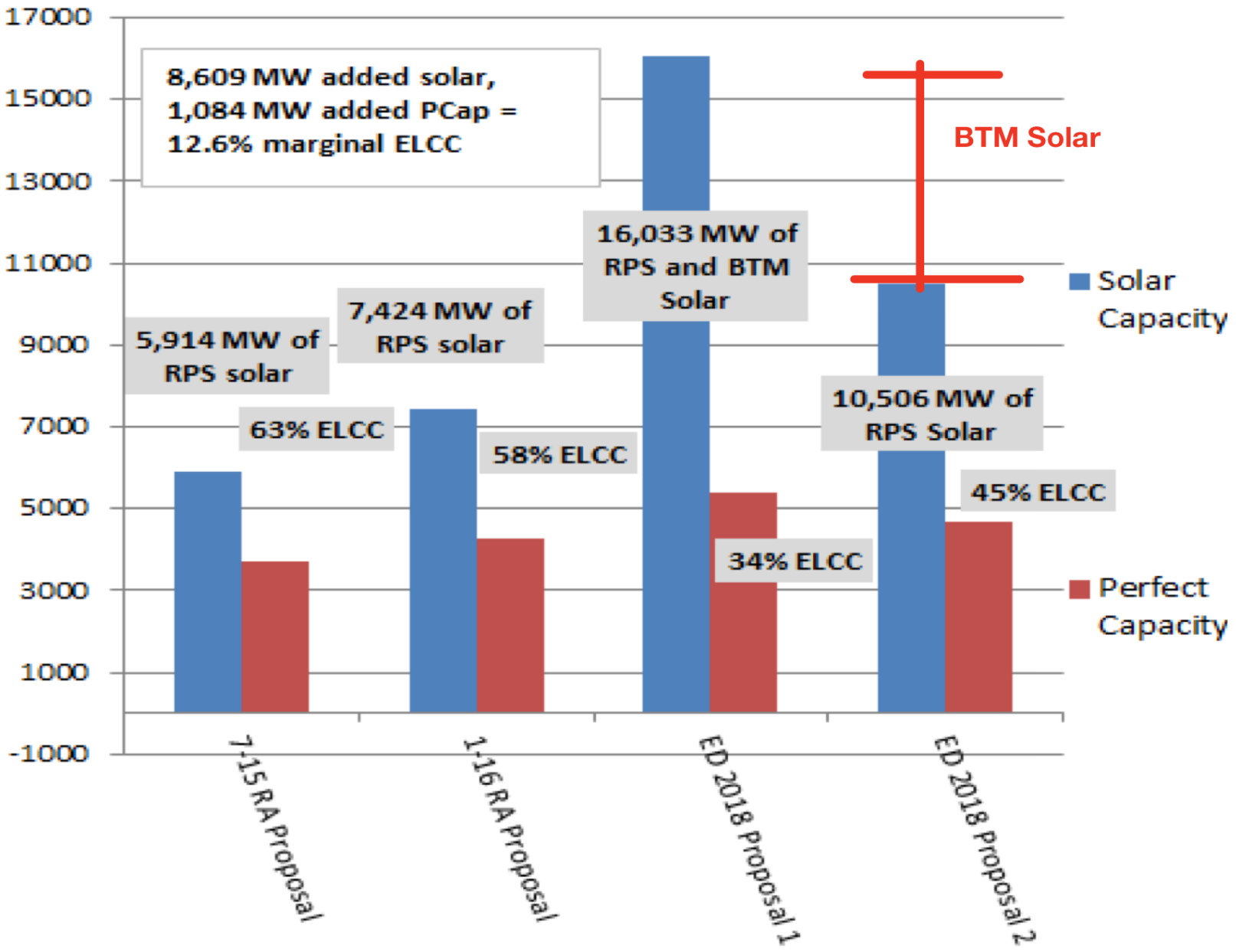
- RA prices doubled between 2018 and 2019.
- Only 463 MW of new resources came online since 2018 significantly less than the capacity retired during that period.
- Nearly 2,000 MW of solar and wind capacity will be lost due to declining ELCC values and several thousand MW of once-through-cooling generators are slated to retire.

Figure E.10 Generation additions and retirements (June 2015- June 2019*)



RA Value of Renewable Resources

- Historically based on “exceedance” approach:
  - The minimum amount of generation produced by the resource in a 70% of included hours.
- Now- Effective Load Carrying Capability (ELCC %) and Qualifying Capacity (QC) of wind and solar resources.
- ELCC- derating factor applied to maximum output (Pmax) to determine its QC.


17000
15000
13000
11000
9000
7000
5000
3000
1000
-1000
8,609 MW added solar,
1,084 MW added PCap =
12.6% marginal ELCC
5,914 MW of RPS solar
63% ELCC
7,424 MW of RPS solar
58% ELCC
16,033 MW of RPS and BTM Solar
34% ELCC
10,506 MW of RPS Solar
45% ELCC
BTM Solar
Solar Capacity
Perfect Capacity
7-15 RA Proposal
1-16 RA Proposal
ED 2018 Proposal 1
ED 2018 Proposal 2

CalCCA Proposal

- Prescribe the volume of RA each IOU must make available to the market
- Require the IOUs to offer excess RA products for up to a three-year term
- Develop guidance on the use of price floors in IOU requests for offers to ensure the IOUs maximize the volume of RA that can be sold.

Central Procurement Entity (RA-CPE)

- Meet Residual of a three-year forward procurement obligation that is not met by individual LSEs.
- RA-CPE will be a competitively neutral, independent, and creditworthy entity
- Who will be RA-CPE?
  -