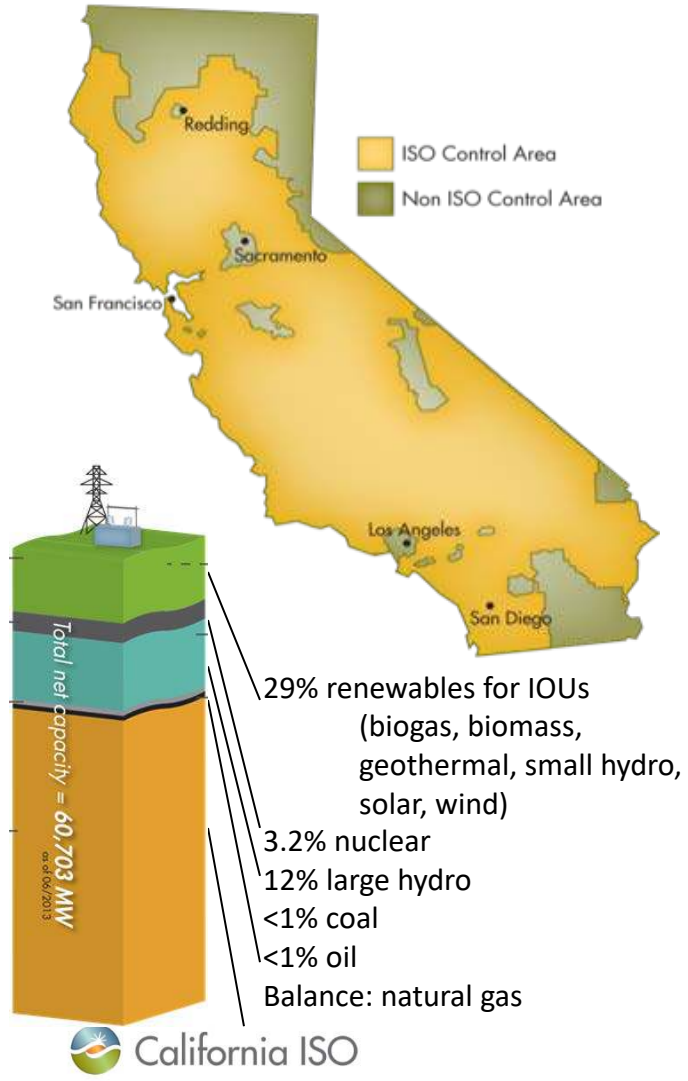
Integrated Resource Management – Challenges and Opportunities

Jim Price
Senior Advisor, Market Quality and Renewable Integration
California ISO

Energy Affiliates Forum – UC Davis
April 19, 2018

2018 CAISO - Public

California ISO is one of 9 ISO/RTOs in North America, providing open, non-discriminatory transmission access



Responsibilities:

- Reliability, grid planning, outage coordination
- Market development, operations, monitoring

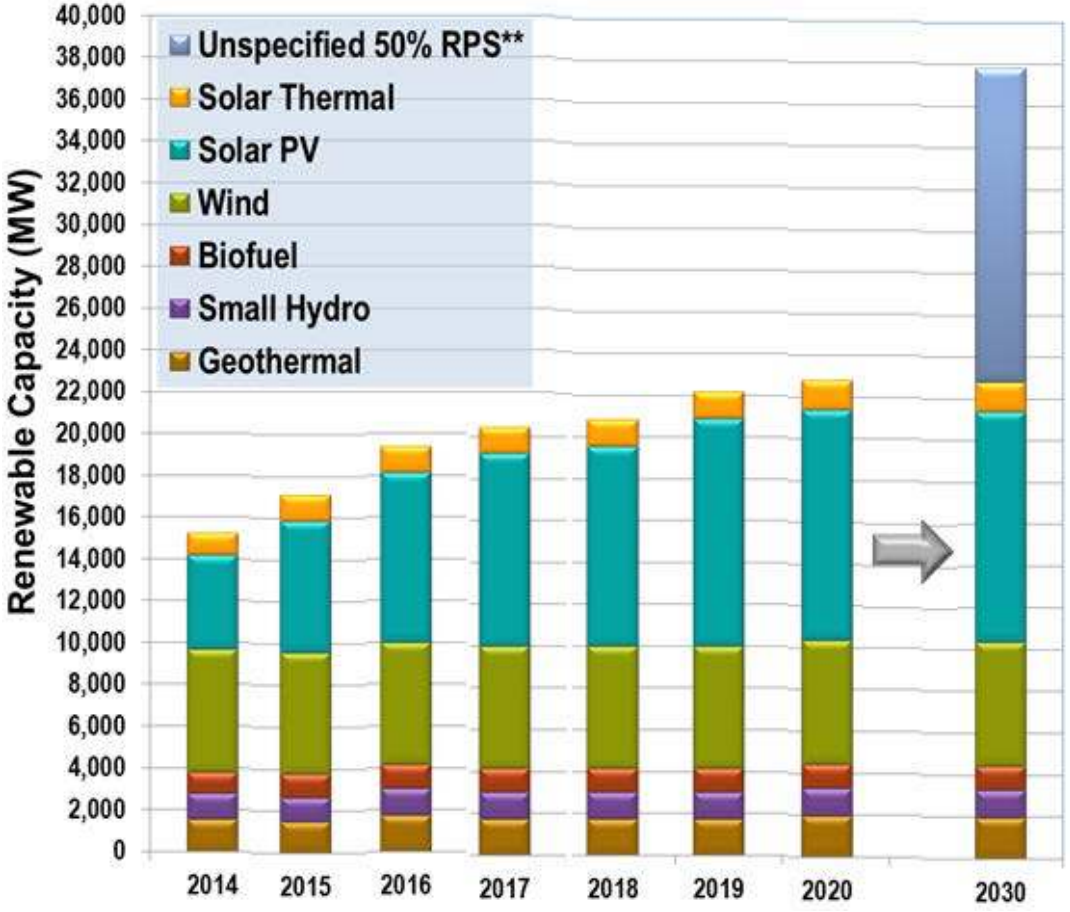
CAISO manages ~80% of California's electric load

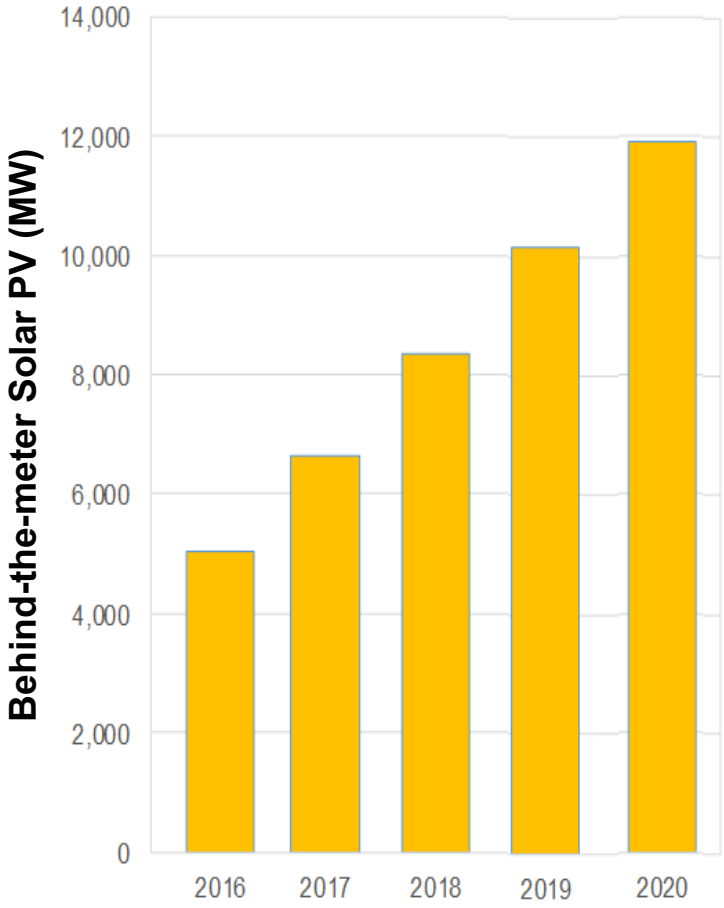
- 50,270 MW record peak demand (7/24/2006)

Changing resource mix presents challenges:

- Supply volatility: Over 20,000 MW of wind and solar capacity to be interconnected by 2020
  - 4985 MW wind on 5/16/2017,
    10,428 MW solar on 3/30/2018
- Less predictable load, with distributed generation and electric vehicles
- 18,000 MW thermal resources being repowered or retired
  - Phase out 12,000 MW of coastal plants with once-through cooling, by 2020
  - Greenhouse gas reductions limit replacements
  - Water flow management affects hydro availability

About 4,000 MW of new grid-connected renewables by 2020 plus 10,000-15,000 more by 2030, plus behind-the-meter solar PV

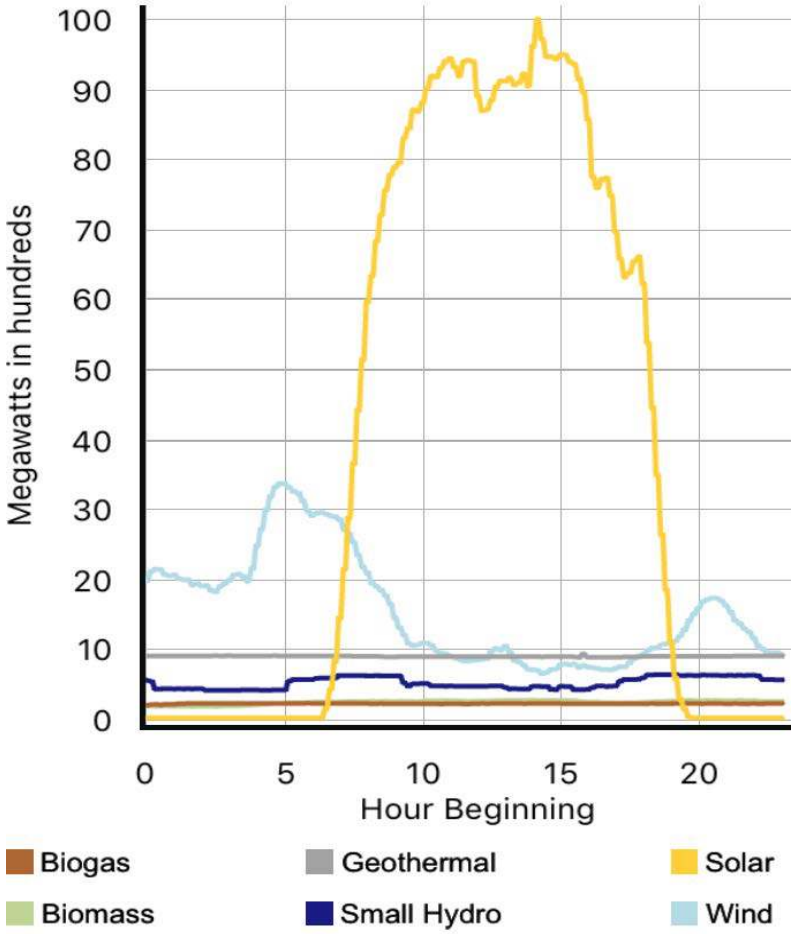


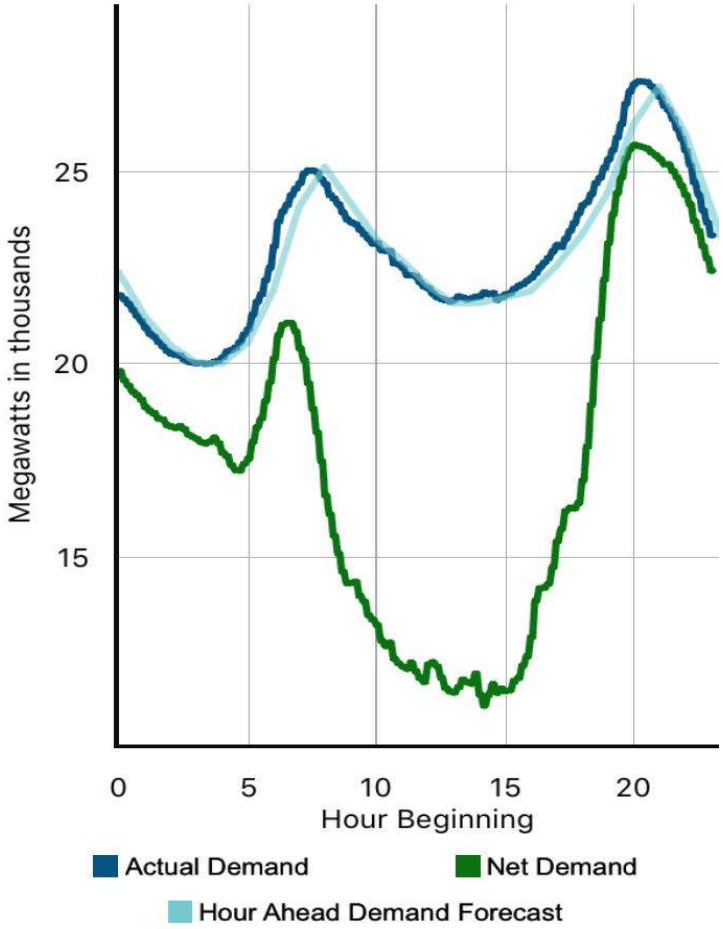


**Approximate
(IOU data through 2017 and RPS Calculator data 2018-2020)

Ongoing changes in supply and demand present both challenges and opportunities

(Source of data: “ISO Today” iPhone App, 4/17/2018)

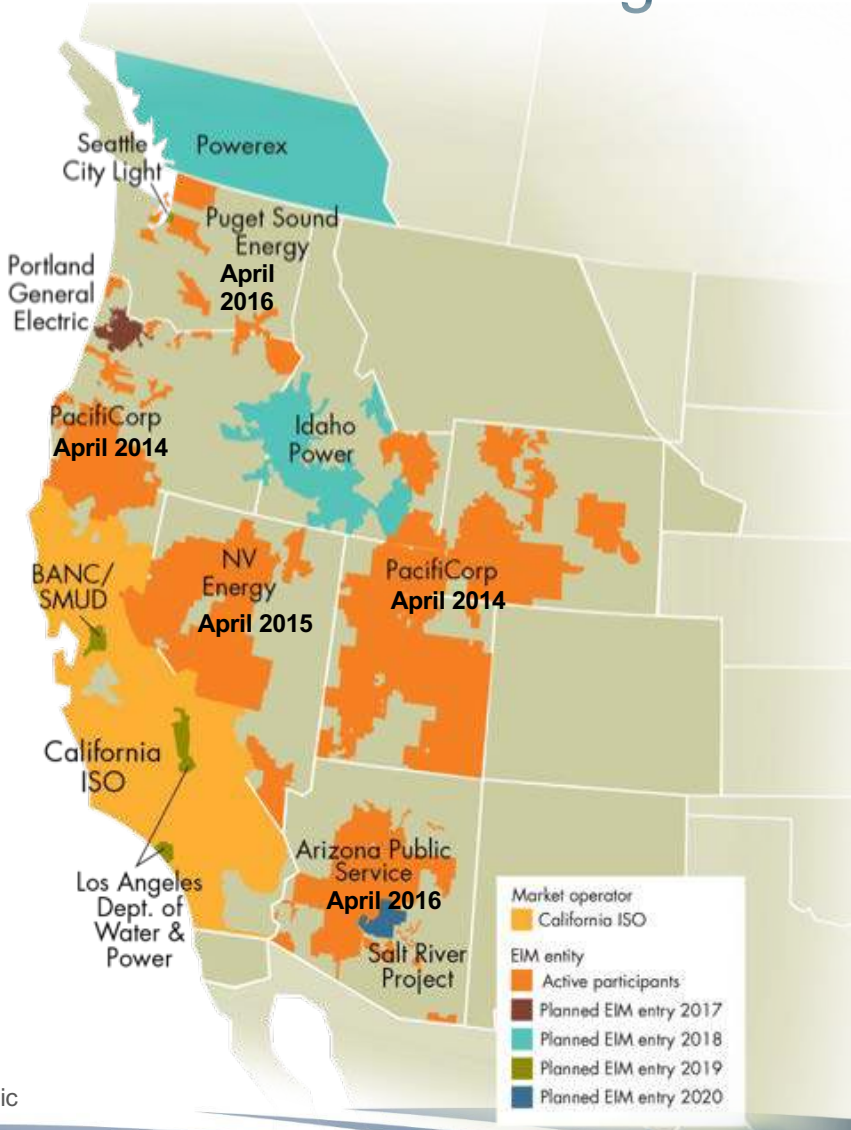




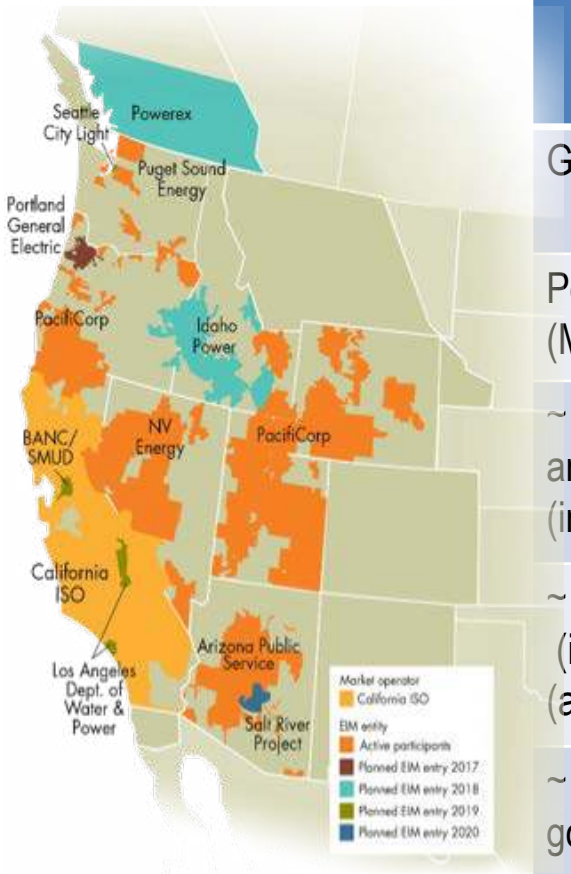
California ISO

Energy Imbalance Market adds flexibility as an easily-scalable extension of real-time market to broader region

- Builds on existing market: automated dispatch minimizes cost, facilitates renewables, resolves imbalance & avoids congestion
- Situational awareness enhances reliability
  - FERC staff paper documented EIM benefits: http://www.caiso.com/Documents/QualitativeAssessment-PotentialReliabilityBenefits-WesternEnergyImbalanceMarket.pdf
- No critical mass required. No exit fees
- Easily scalable, low-cost, low risk, voluntary option for new participants
- Preserves BAA autonomy, including compliance, balancing, and reserve obligations



EIM provides significant net benefits for diverse participants. Total gross benefits = $288 million through Q4 2017



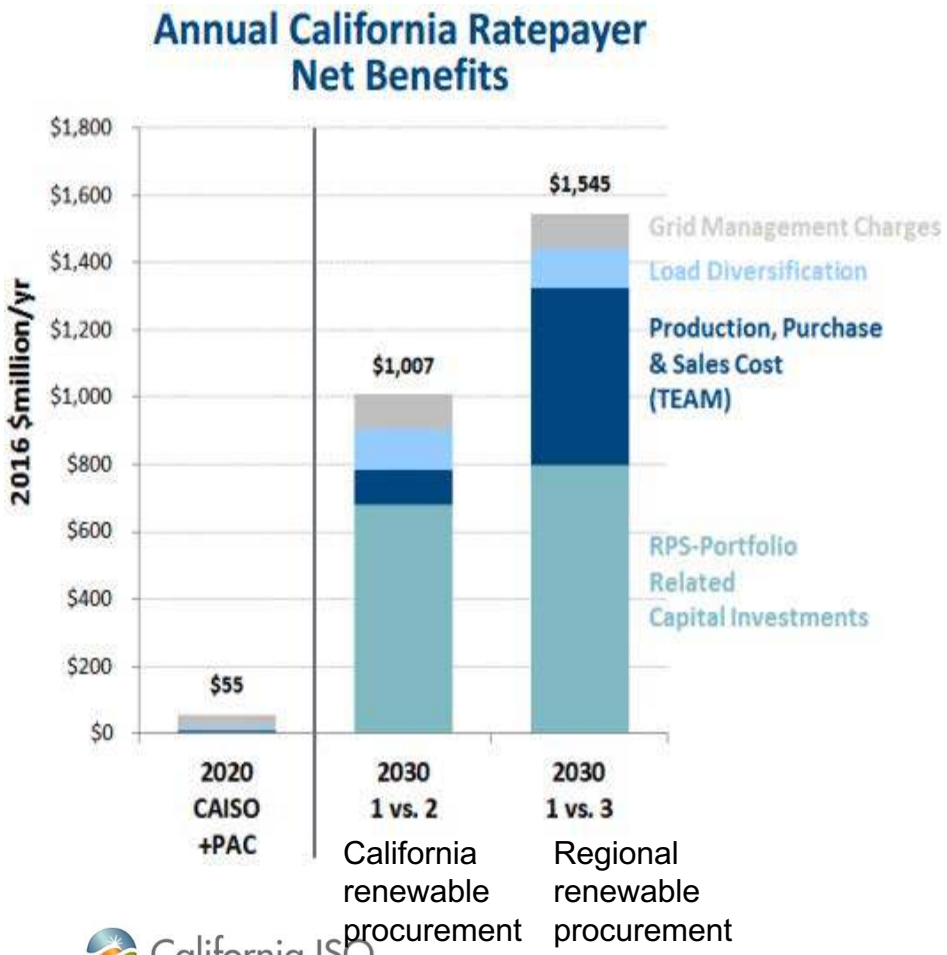
	PacifiCorp	NV Energy	Puget Sound Energy	Arizona Public Service
Go Live	Nov. 2014	Nov. 2015	Fall 2016	Fall 2016
Peak Demand (MW)	9,500	8,148	4,912	7,000
~ Expected annual benefits (in millions)	$21-$129	$9-$18 (2017), $15-$29 (2022)	$18-$30	$7-$18
~ Start-up costs (in millions) (anticipated)	$20	$11.2	$14.2	$13.5
~ Annual on-going costs (in millions)	$3	$2.6	$3.5	$4

California ISO

Regional collaboration offers further opportunities for participation in CAISO markets and operations

- California's Senate Bill 350 (October 2015), Clean Energy & Pollution Reduction Act, established clean energy, clean air and greenhouse gas reduction goals for 2030 and beyond:
  - Reduce greenhouse gas to 40% below 1990 levels, increase renewable electricity to 50% & double end-use energy efficiency savings by 2030
  - Require Integrated Resource Plans from large utilities
  - **Transform CAISO into regional organization, subject to approval by legislature**
  - Authorize utility transportation electrification activities
- To facilitate moving toward regional organization, CAISO has supported several studies and stakeholder processes
  - Study results, modeling, and assumptions are available at http://www.caiso.com/informed/Pages/RegionalEnergyMarket/BenefitsofaRegionalEnergyMarket.aspx

Across multiple scenarios (extent of participation, renewable resource portfolios, etc.), regional market would have substantial benefits to California ratepayers.



Estimated California savings of expanded regional market:

- $55 million/year in 2020 for limited CAISO + PacifiCorp region.
- $1 billion to $1.5 billion/year in 2030 for WECC less federal agencies, depending on in-state vs. regional renewable procurement
- Overall benefits likely larger: regional benefits not quantified
- Additional unquantified benefits: increased reliability due to larger regional market and system monitoring, improved transmission planning, improved risk mitigation, generation investment incentives

Current opportunity: Enhancing day-ahead market and extending to EIM participants, for regional benefits

- Grid operation challenges within CAISO show that day-ahead market enhancements can better manage real-time net load:
  - 15-minute scheduling to ensure unit commitment with sufficient ramping capability
  - Day-ahead flexible reserve product to compensate resources for real-time must-offer obligation
  - Merger of residual unit commitment into market clearing to match both bid-in demand and net load forecast
  - Improved modeling of intertie transaction sources/sinks
  - Lower barriers to market participation by distributed resources
- Extending DA market to EIM participants provides regional benefits:
  - Regional unit commitment and improved market efficiency and renewable integration
  - Balancing authorities and state regulators retain control of reliability, integrated resource planning, transmission planning and investment

The Long Game: Unlocking the "Dividend" from California's investment in renewables

- California has invested $billions in renewable resources
- CAISO sees broad benefits from regional collaboration
- New opportunities for energy-wise consumers:
  - Electric vehicle charging
  - Industrial processes
  - Cooking and heating
  - Bulk and local energy storage
- A new "dividend:" Clean, plentiful energy that can electrify a low-carbon economy
- Then…incent these sectors to fully participate as providers of market services