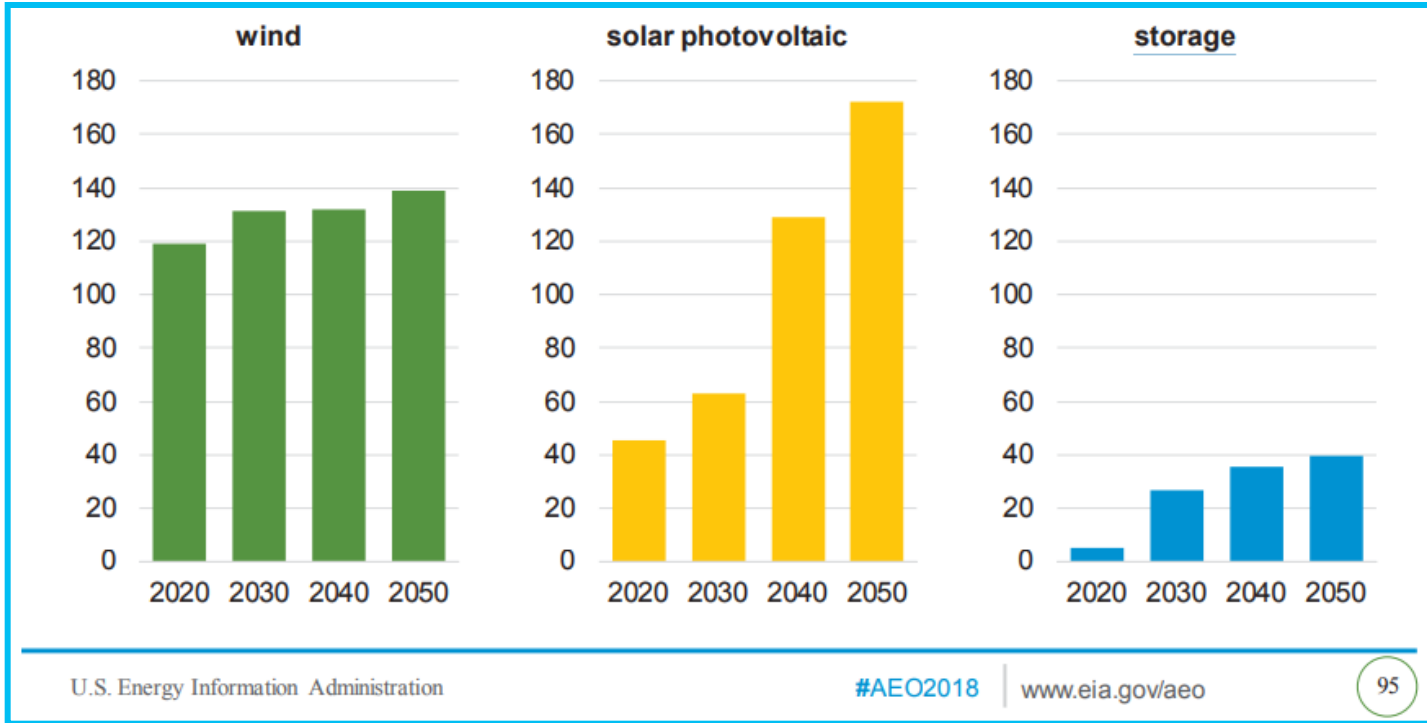


# Energy Storage Capacity Growth Projections



# Regulatory Agencies – Ecosystem



- California Public Utilities Commission (CPUC)
- California Energy Commission (CEC)
- California Independent System Operator (CAISO)
- Federal Energy Regulatory Agency (FERC)

# Statutory Framework (California)

2009

- **Senate Bill (SB) 412**: financial incentives for stand-alone energy storage technologies.

2010

- **Assembly Bill (AB) 2514**: directed the CPUC to set energy storage targets for electric utilities.

2015

- **SB 350**: emission reductions to 40% of 1990 levels and 50% renewables by 2030.

2016

- **AB 33**: CPUC and CEC to analyze long-duration bulk energy storage

2017

- **SB 801**: 20 MW energy storage to meet local energy reliability requirements in SoCal

2018

- **SB 100**: 50%, 60% and 100% renewables by 2026, 2030 and 2045, respectively.

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# Regulatory Framework – CPUC

- **Rulemaking (R.) 10-05-004/Decision (D.) 11-09-015 (SGIP):**
  - SGIP included stand-alone advanced energy storage technologies.
- **R.10-12-007/D. 13-10-040 (Energy Storage Mandate):**
  - 1,325 MW of energy storage in four biennial solicitations through 2020.
  - Three IOUs filed plans for the initial solicitation; approved Dec. 2014 (D. 14-10-04)
- **R.15-03-011 (Energy Storage Roadmap):**
  - Refine policies and program details as required or recommended in D. 13-10-040 and D.14.10-045
- **R. 16-02-007/ D. 18-02-018 (Integrated Resource Planning):**
  - Reference System Plan for resource planning by 2030 increased storage needs.
- **R. 11-09-011 (Rule 21), R. 14-07-002 (NEM), R. 14-10-010 (Resource Adequacy):**
  - Timely, non-discriminatory, cost-effective, transparent interconnection of energy storage.
  - Incentives to pair storage facilities with NEM eligible facilities (e.g., solar).
  - Reliable grid operation and incentives for resources needed for future reliability

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# R.10-12-007 - Energy Storage Procurement

<i>Pacific Gas and Electric</i>					
	Target	On-Line Storage	Approved, Some Are in Progress	Pending Approval	TOTAL PROCURED
Transmission	310	0	0	692.5	692.5
Distribution	185	6.5	10	20	36.5
Customer	85	26.1	0	20	46.1
<i>Southern California Edison</i>					
	Target	On-Line Storage	Approved, Some Are in Progress	Pending Approval	TOTAL PROCURED
Transmission	310	20	100	0	120
Distribution	185	56	65.5	10	131.5
Customer	85	110	195	0	305
<i>San Diego Gas &amp; Electric</i>					
	Target	On-Line Storage	Approved, Some Are in Progress	Pending Approval	TOTAL PROCURED
Transmission	80	40	39	0	79
Distribution	55	43.6	13.5	0	57.1
Customer	30	30	0	0	30
<b>TOTAL – All IOUs</b>	<b>1,325</b>	<b>332.2</b>	<b>423</b>	<b>742.5</b>	<b>1,497.7</b>

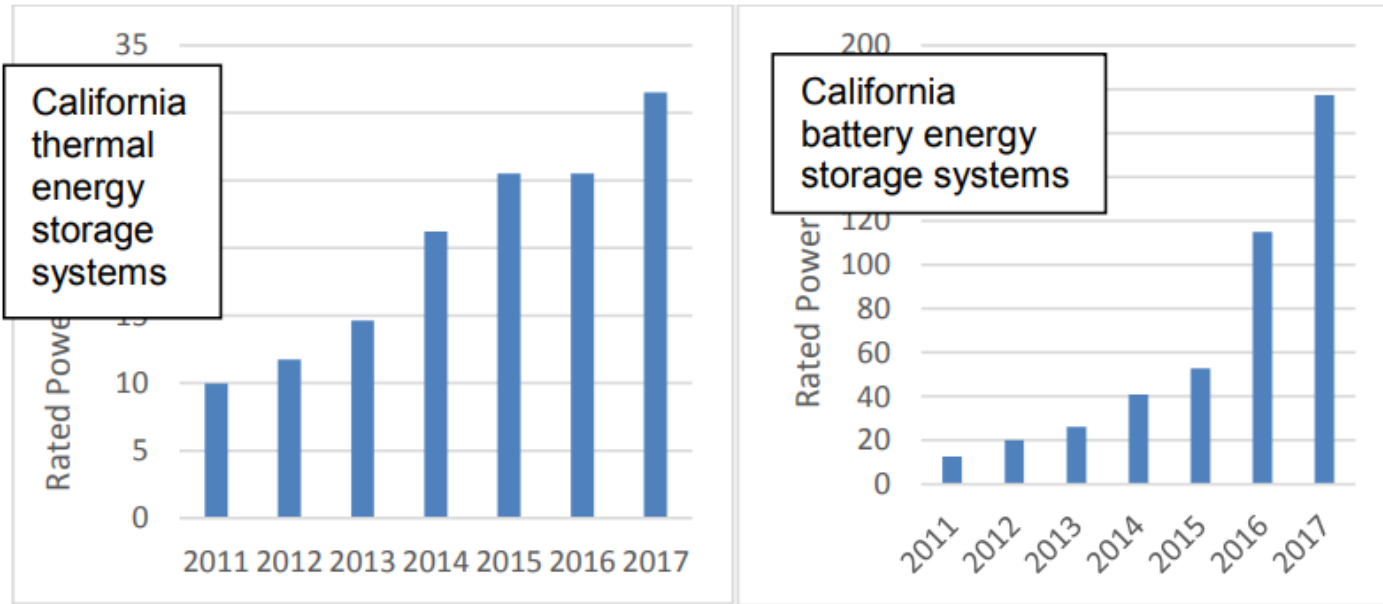
As of August 2018, IOUs have procured or are seeking to procure 1,497 MW of storage, an increase from 475 MW in Feb. 2017.

Projects must be installed by 2024.

332 MW are already online.

# R.10-12-007 - Energy Storage Mandate

Figure 2: Growth in California Thermal and Battery Energy Storage Systems



Source: Energy Commission staff using U.S. Department of Energy, Energy Storage Database data



## R. 16-02-007 (IRP) - Reference System Plan

- No new natural gas fired (retirements expected)
- 200 MW of new geothermal (1.7%)
- Approximately 9,000 MW of utility-scale solar (73%)
- 1,100 MW of in-state wind (9%)
- 2,000 MW of battery storage (16.3%), incremental to the 1,325 MW already required in other CPUC proceedings



# Regulatory Framework – CEC

## Publicly Owned Utilities

Integrated Energy Policy Report  
(IEPR)

1,247 MW - LADWP (Castaic  
Pumped Storage)

59 MW – Other POU's  
(Procurement through 2017)

224 MW – Planned  
(Procurement through 2021.)

## Foundational Demonstration Projects

Sodium sulfur battery  
storage  
(Pacific Gas & Electric)

Microgrid systems  
(SDG&E Borrego Springs)

## R&D Projects (EPIC Funding)

Flywheel technology (Amber  
Kinetics)

Chemical battery (Eos  
Energy Storage)

Vehicle-to-grid (LA  
Air Force Base)

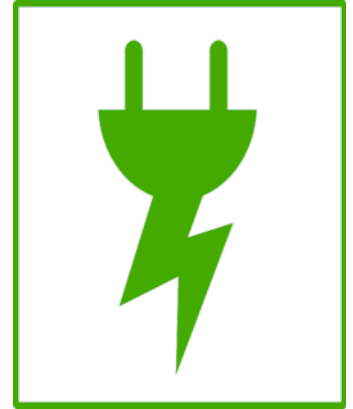
Value estimation tool  
(StorageVET)

PV Integration (El Verano  
Elementary School)

# Regulatory framework – CAISO

- Non-generator resources in Ancillary Services
- Regulation Energy Management (new resource model)
- Lower Bid Floor
- Flexible Ramping Constraint
- Pay for Performance Regulation
- 15-Minute Scheduling & Settlement
- Reliability Services
- Flexible Ramping Product
- Flexible resource adequacy criteria and must offer obligations
- Energy storage interconnection and roadmap

# Regulatory framework – FERC Order No. 841 (02/15/18)



- Directs RTOs and ISOs to revise tariffs for wholesale market rules for energy storage that must include participation models.
- Principles for participation model:
  - Ensure eligibility based on technical capacity of resource
  - Ensure storage can be dispatched and set wholesale prices as seller and buyer
  - Bidding parameters for physical and operational characteristics
  - Minimum size requirement no more than 100 Kw
- Round-trip transactions must be at the wholesale locational marginal price
- Continue to explore the proposed distributed energy resource aggregation reforms under separate docket

# Contact us



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