California Energy Storage Market

Key Market & Policy Drivers

September 18, 2018

CESA
CALIFORNIA ENERGY STORAGE ALLIANCE

About CESA

The **California Energy Storage Alliance (CESA)** is a 501c(6) membership-based advocacy group committed to advancing the role of energy storage in the electric power sector through policy, education, outreach, and research.

CESA's mission is to make energy storage a mainstream energy resource in helping to advance a more affordable, clean, efficient, and reliable electric power system in California.

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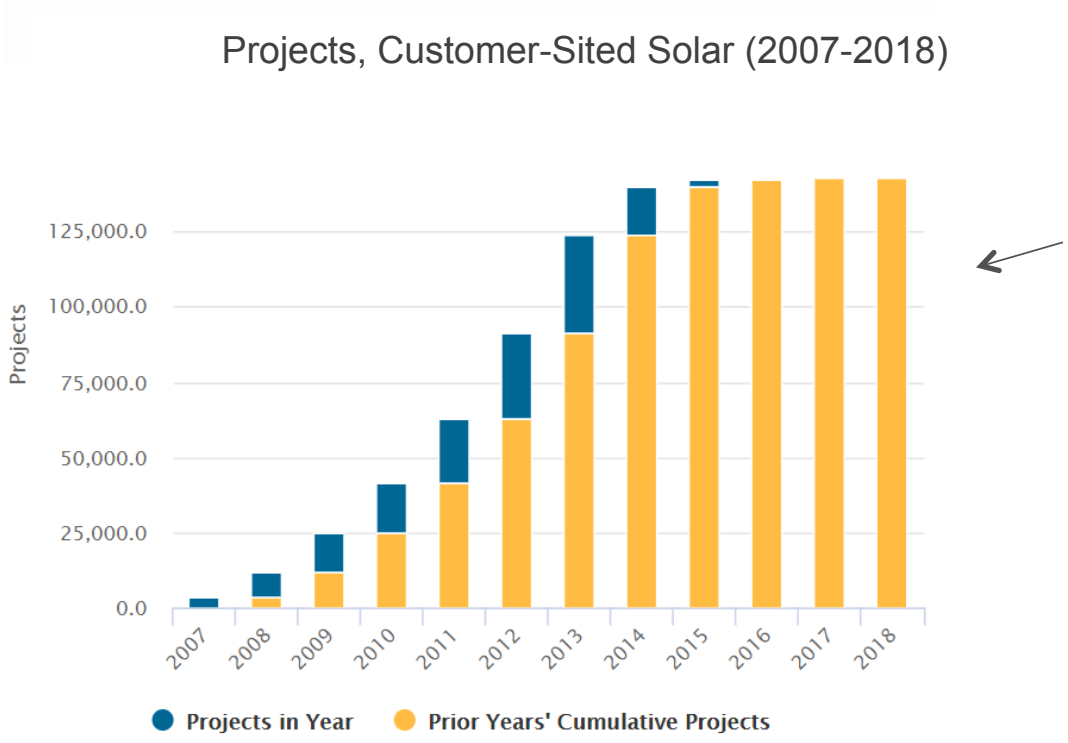
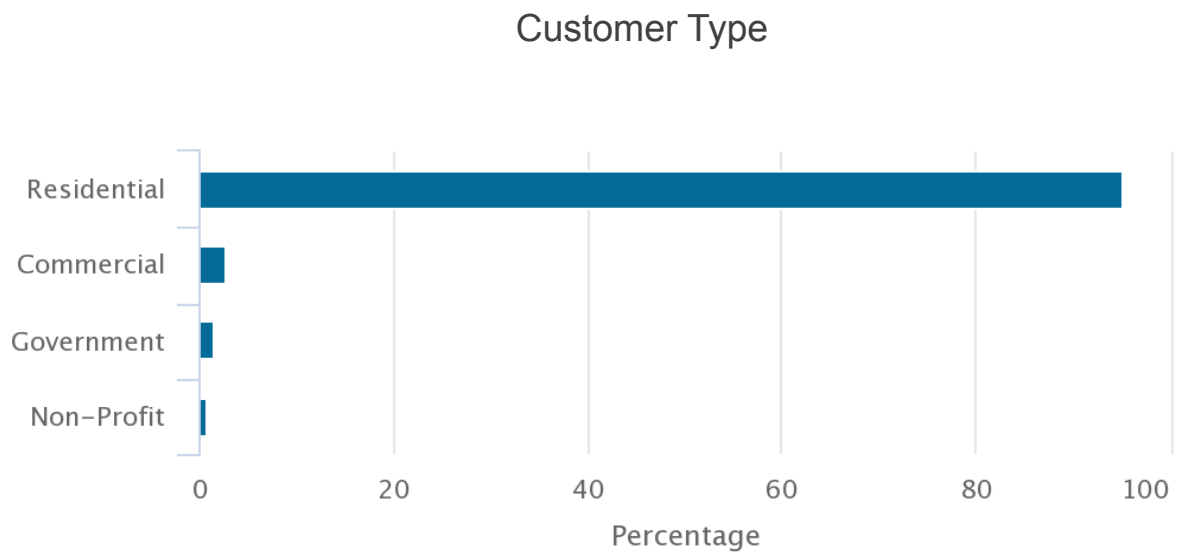
BTM Deployments will Continue to Grow

Helpful to recall the uptake curve of solar in the 2007-2015 timeframe: 142,164 solar projects deployed in California



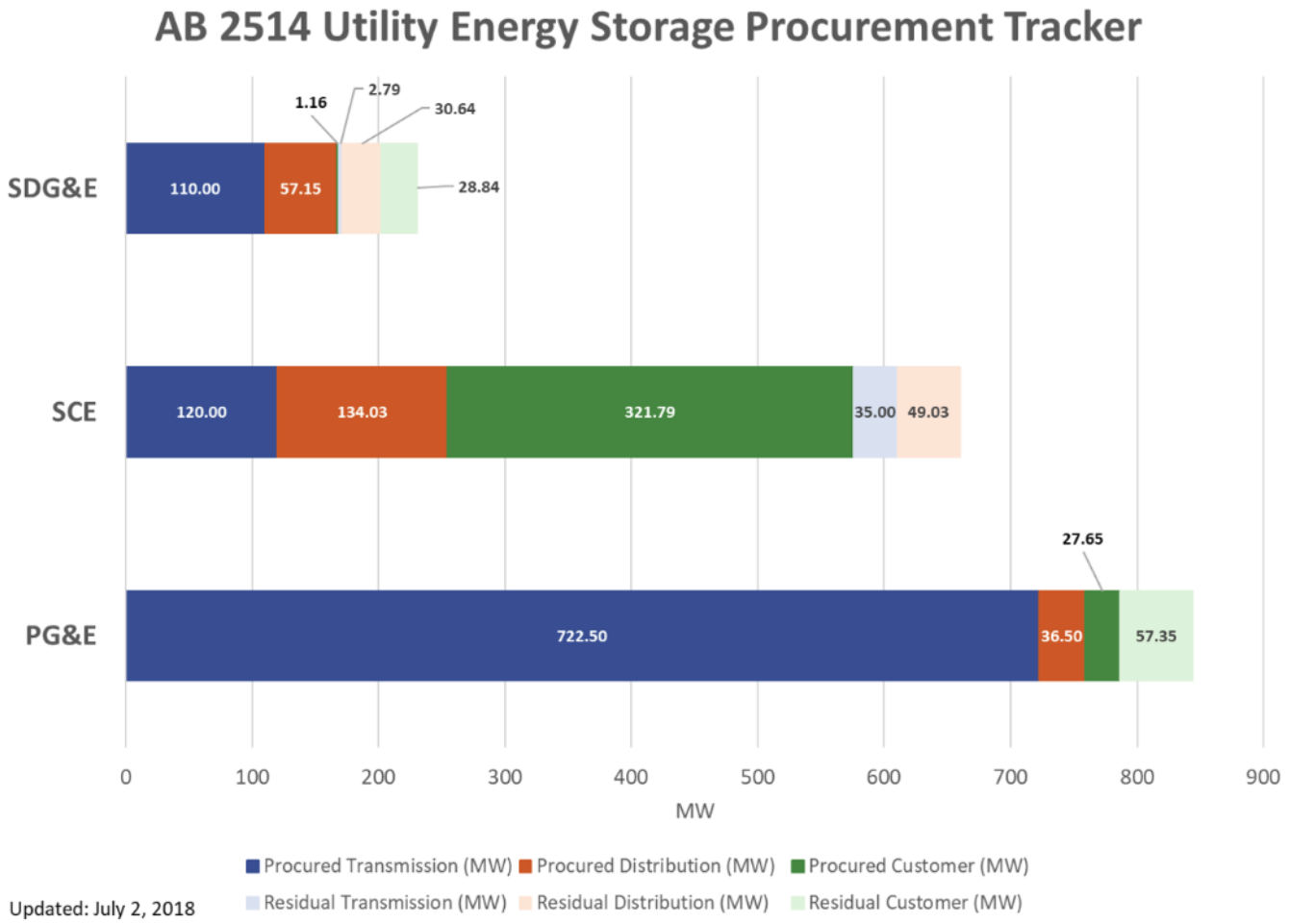


Source: California Solar Initiative, 2018

Energy Storage Is Arriving

Each of California's three investor-owned utilities (IOUs) are making major progress toward their 1,325 MW energy storage procurement target by 2020

99.5 MW of energy storage that was procured and operational *in 6 months* to address reliability issues stemming from limitations of the Aliso Canyon gas storage facility.



Source: California Energy Storage Alliance, 2018

Keys to Growing the Energy Storage Market

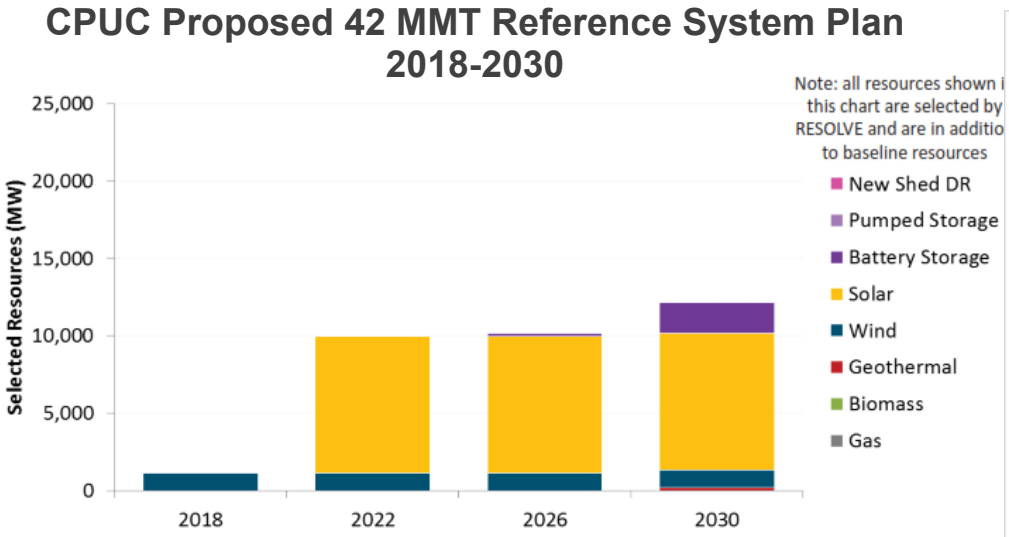
California continues to make progress as the worldwide leader in energy storage deployments and opportunities to provide grid services because of progress along three key areas

Growing the Pie

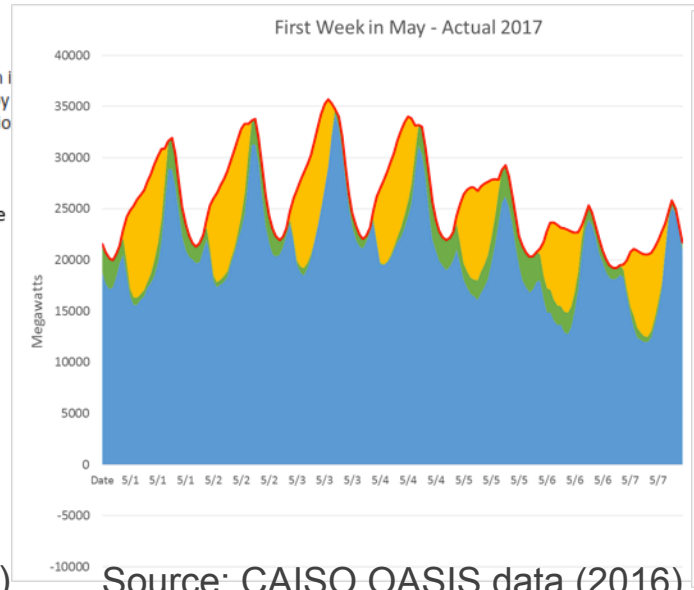
- **Continued progress toward AB 2514 targets of 1,325 MW by 2020:**
  - Most storage being procured to meet local capacity needs (4-hour RA capacity)
- **New authorizations for utilities under AB 2868 of 500 MW (25% cap on BTM):**
  - Proposals are being developed to identify investments that focus on low-income, public sector
- **Demonstrating storage reliability/economic option value through expedited storage procurements:**
  - 99.5 MW of energy storage was procured and operational in 2017 to address reliability issues stemming from limitations of the Aliso Canyon gas storage facility
  - 567.5 MW of energy storage procured to reduce reliance on costly backstop procurement of gas (Moorpark, Moss Landing, future economic gas retirements)
- **Self-Generation Incentive Program (SGIP) expansions and enhancements:**
  - Over $400M is available through 2019 for BTM storage systems, including Equity Budget set-aside
  - SB 700, upon signing by Governor, will extend program at $166M/year through 2024

Improving Valuation

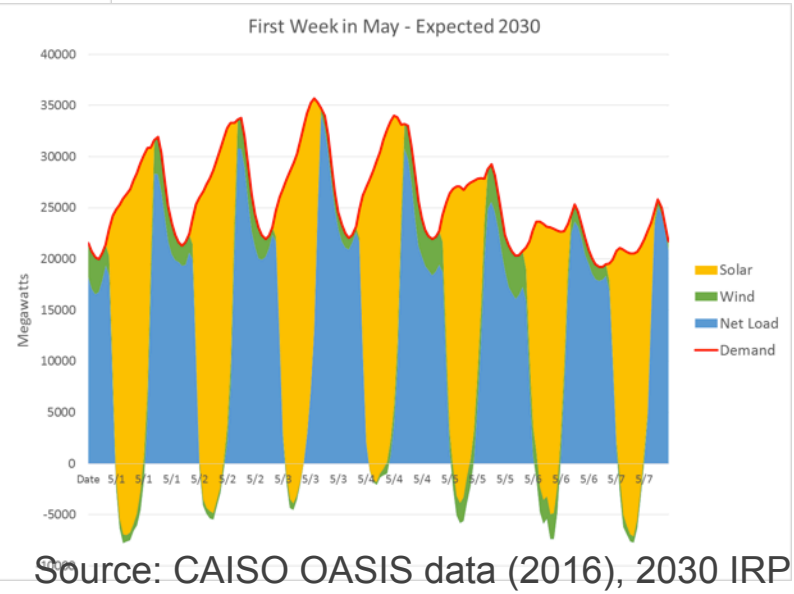
- **The CPUC's Reference System Plan recommends +2,000 MW of battery storage through 2030 to help integrate + 9,000 MW of utility-scale solar PV and + 1,100 MW of wind in California, (on top of +16,000 MW of additional rooftop PV):**
  - CESA's analysis finds that the need for storage may be underestimated due to modeling assumptions around storage costs, hybrid storage, curtailment, and gas resources



Source: E3 RESOLVE Model & CPUC IRP Workshop (2017)



Source: CAISO OASIS data (2016)



Source: CAISO OASIS data (2016), 2030 IRP Proposed Reference System Plan Scenario

Improving Valuation

- **Reforms to Flexible RA product are needed since Flex RA prices are negligible:**
  - An effective Flexible RA product definition will compensate storage for their 'elite' flexibility characteristics and support state planning for resource traits needed (but due to current product definitions, slow-ramping resources qualify for Flex RA)
- **Reforms to calculating the capacity value of solar+storage and wind+storage resources (as well as other changes) are needed since procurement is currently siloed for solar/wind vs. storage:**
  - There are significant cost and efficiency benefits of hybridizing storage with solar, wind, and gas, but compensation, procurement, and modeling of these systems are still in early stages
- **Multiple-use application (MUA) framework adopted services, domains, and rules to govern resource performance, measurement/settlement, and incrementality:**
  - This should enable greater utilization of energy storage assets and improve cost-effectiveness of storage resources in solicitations and programs

Reducing Barriers

- **Interconnection processes (including retrofits and modifications), metering configurations, and software controls can be agreed upfront to streamline:**
  - Approval of software control schemes may reduce the cost of having to 'meter everything'
  - Approval of fast-track processes for specific configurations or thresholds where there is *de minimus* impacts to grid (*e.g.*, storage size, non-export storage)
- **Standards and standard testing protocols are needed to support comparability, ease of interconnection, and assurance of safety/reliability**
  - Standards and protocols protect consumers and expedite approval processes for end users, especially for emerging storage technologies
- **Wholesale market participation models should accommodate storage (see Order 841), such as reasonable size thresholds, use limitation status, station power, etc.:**
  - Proxy Demand Resource (PDR) enables BTM storage and EVSEs to participate, including now for load consumption during negative pricing periods
  - Non-Generator Resource (NGR) enables IFOM storage to participate in all CAISO markets, but there are challenges for BTM and aggregated storage participation in NGR

Key Takeaways & Conclusions

- **Growing the pie:**
  - Growth signals and market certainty is needed to direct investment into storage market, where mandates and targets are effective in the early stages (see CA, NJ, NY, OR, etc.)
- **Improving valuation:**
  - To support long-term and more autonomous growth of the storage market, grid services and market products must value storage capabilities, and grid planning frameworks must capture how storage can meet identified grid needs
- **Reducing barriers:**
  - To support the cost-effective and streamlined deployment of storage, key barriers to deployment need to be addressed – such as for interconnection, standards, and market participation models

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