



Towards Utility-Scale PV with BESS

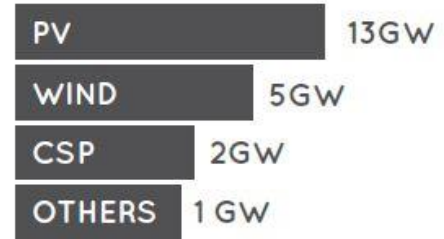
The Perspective of a Technical Advisor

Madrid, March 27, 2017

ASTROM TECHNICAL ADVISORS
ata renewables
Oscar Pereles, COO

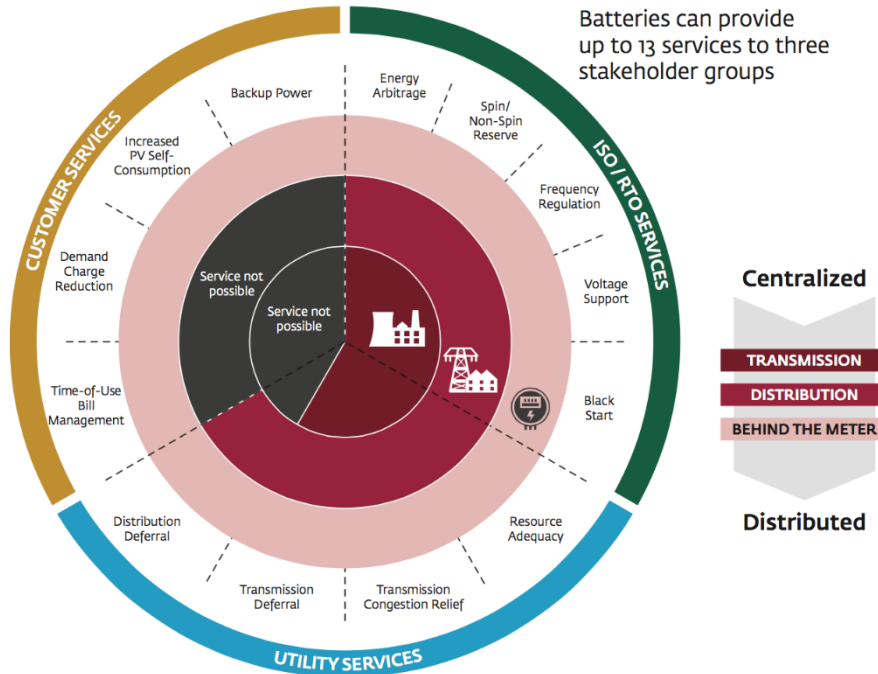


1. ata renewables

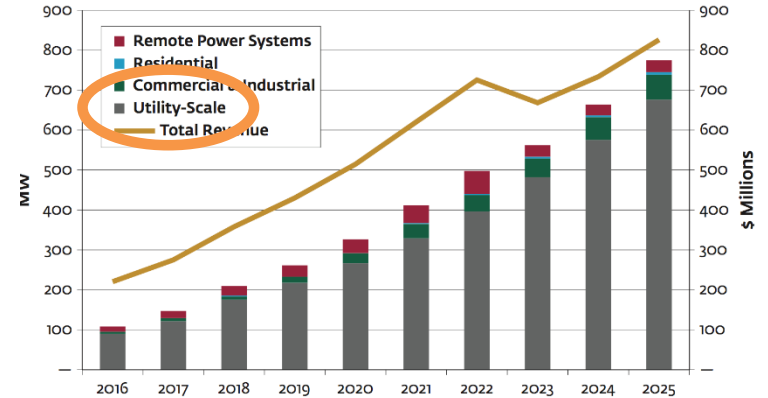


TOTAL
21GW+

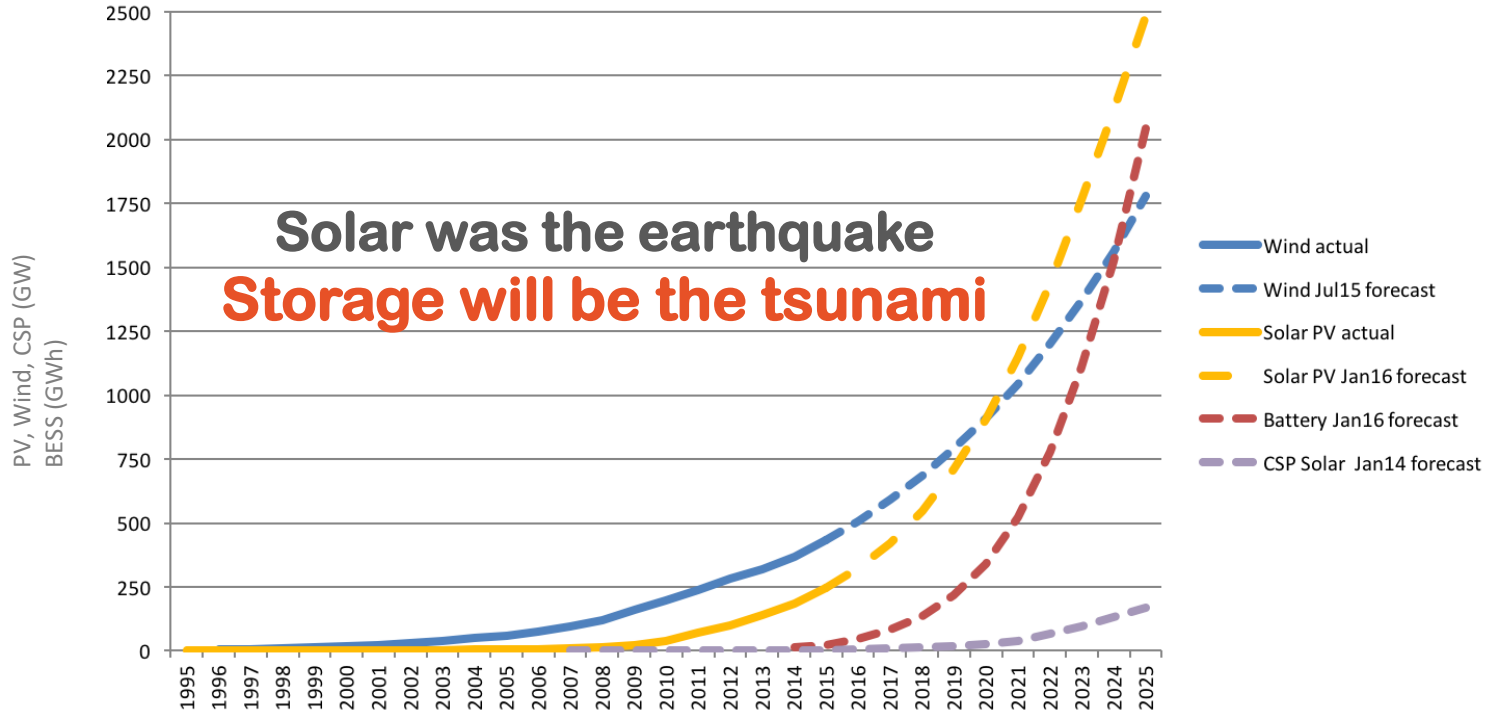
2. BESS value chain, upstream portion



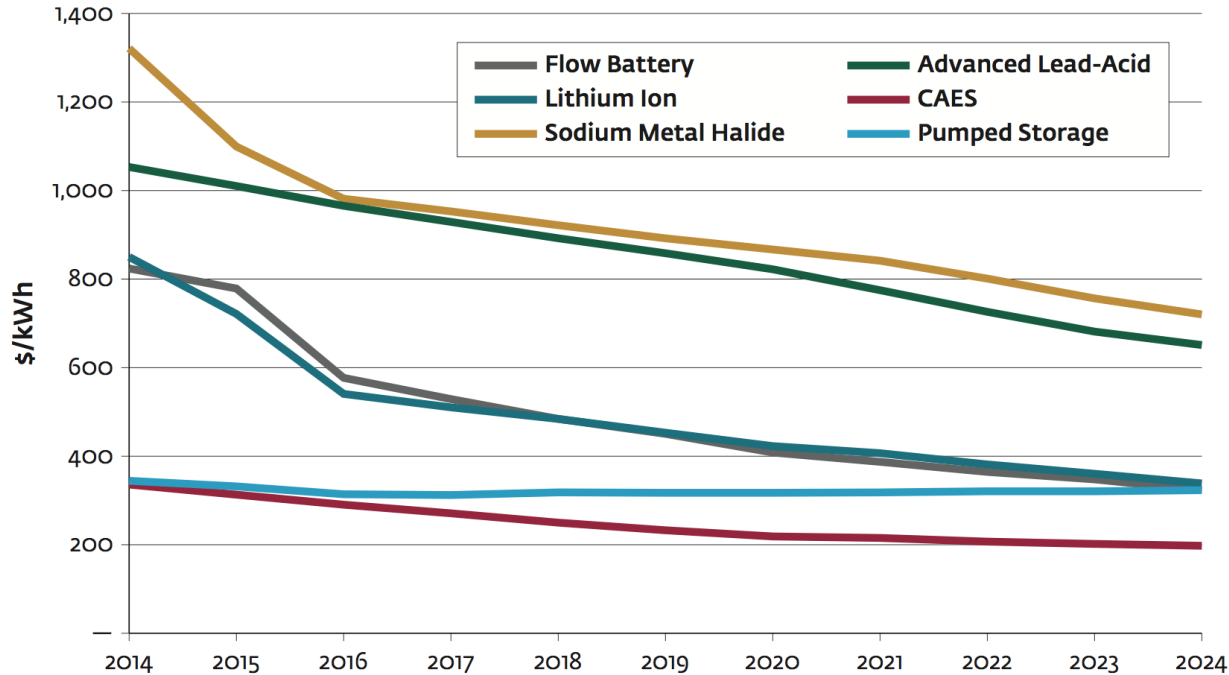
Projected Annual Stationary Energy Storage Deployments, Power Capacity and Revenue by Market Segment, Eastern Europe & Central Asia: 2016–2025



3. Global capacity growth 2015 and forecast to 2025



4. Utility-Scale BESS cost trends

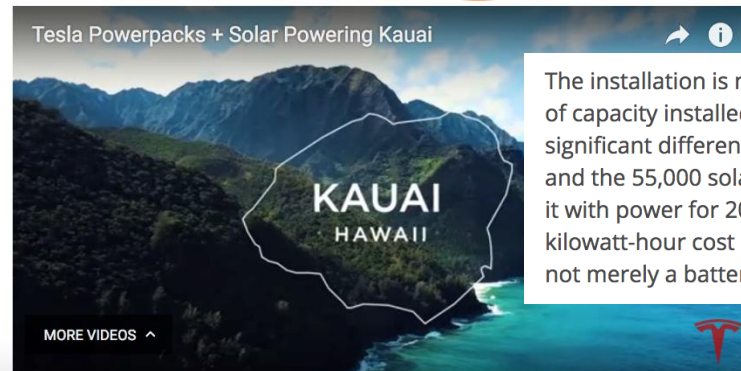


5. BESS for PV energy shifting

Tesla Powerpack Installation On Kauai Turns Tesla Into An Energy Provider

March 8th, 2017 by Steve Hanley

Tesla has completed a battery storage and solar power installation on the island of Kauai that will save 1.6 million gallons of diesel fuel a year, not to mention the tons of carbon dioxide, nitrous oxide, and particulate pollution from diesel generators that will not get spewed into the pristine skies above Kauai. The installation consists of 272 Tesla Powerpack grid scale battery storage units with a combined capacity of 52 megawatt-hours. It also includes a 50 acre solar panel farm capable of supplying 13 megawatts of electricity.



The installation is not as large as the 396 Tesla Powerpack installation with 80 megawatt-hours of capacity installed for **Southern California Edison** earlier this year, but it does have one significant difference. The Kauai Island Cooperative Utility does not own the storage facility and the 55,000 solar panels Tesla does. It has entered into a contract with the utility to supply it with power for 20 years at 13.9 cents per kilowatt-hour. That compares to the 15.5 cents per kilowatt-hour cost of electricity prior to the Tesla contract. It makes Tesla a power provider, not merely a battery storage company.

Source: solarlove.org

5. BESS for PV energy shifting

Elon Musk: I can fix South Australia power network in 100 days or it's free

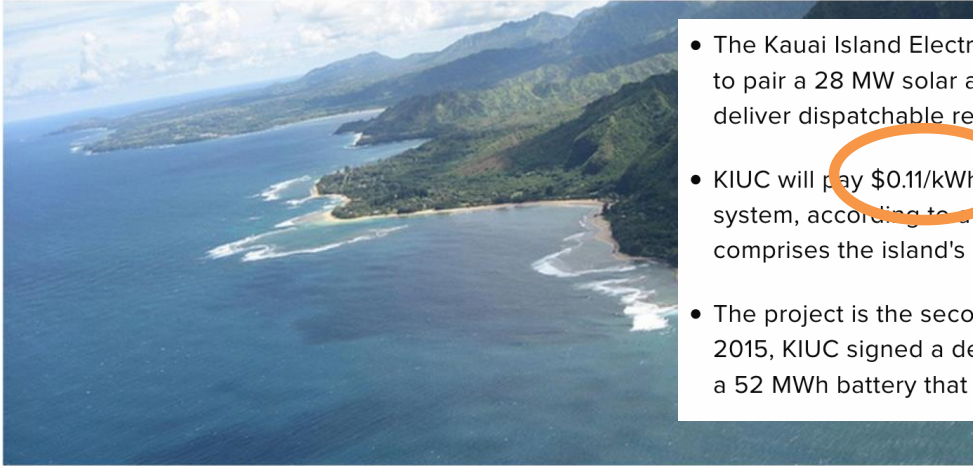
The Tesla founder says he can build a 100MW battery storage farm within 100 days or provide the system free of charge



Tesla recently completed an installation of an 80MWh grid-scale battery farm in southern California within just 90 days, which cost \$100m US.

Source: theguardian.com

5. BESS for PV energy shifting



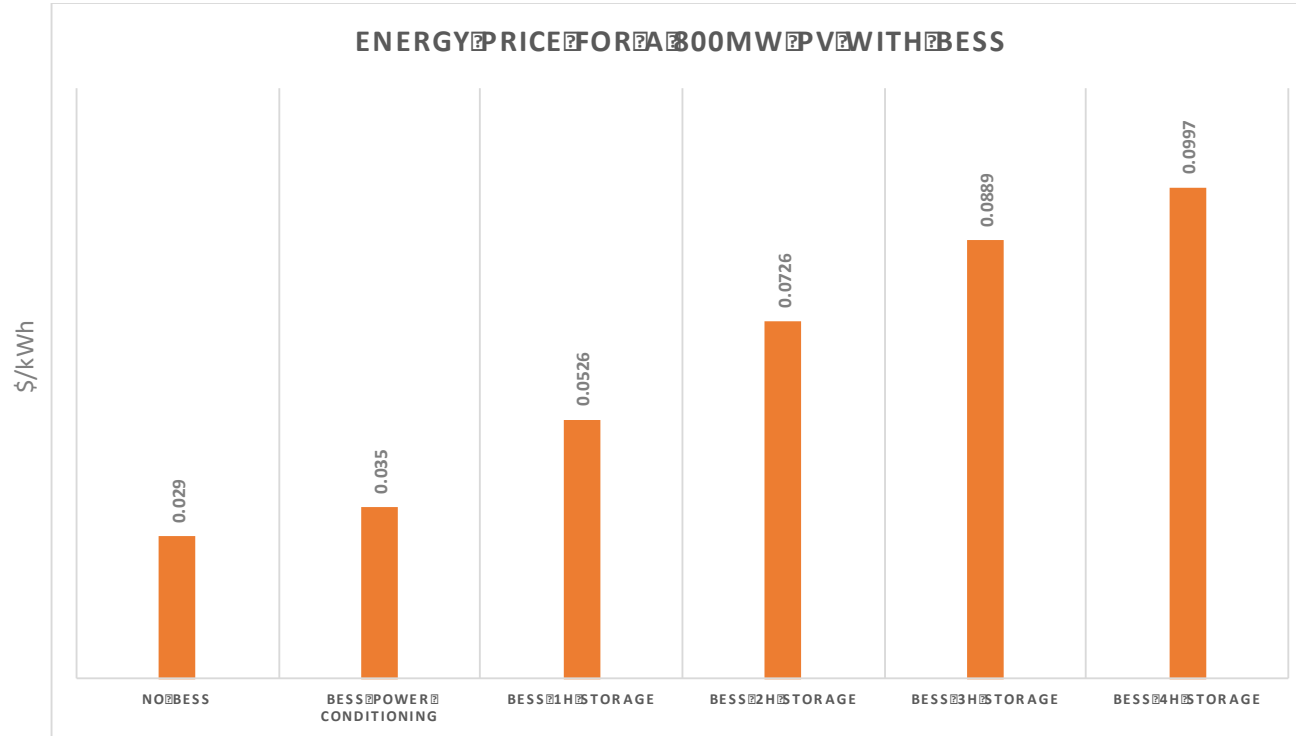
- The Kauai Island Electric Cooperative and AES Corp. announced plans to pair a 28 MW solar array with a 20 MW, 100 MWh battery system to deliver dispatchable renewable generation to the Hawaiian island.
- KIUC will pay \$0.11/kWh for power delivered from the solar-plus-storage system, according to a release, below the cost of oil-fired power that comprises the island's current baseload generation.
- The project is the second flexible solar facility for the small co-op. In 2015, KIUC signed a deal with SolarCity to pair a 13 MW solar array with a 52 MWh battery that will deliver power for \$0.145/kWh.

BRIEF

Hawaii co-op signs deal for solar+storage project at 11¢/kWh

Source: utilitydive.com

6. Utility-Scale PV with BESS. A simplified case study *



* 800 MW PV in UAE with a 25-year PPA and 2.0% escalation

Source: ATA Renewables

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