

Energy Storage Financing Opportunities and Barriers

Role of Analytical Modeling Platforms

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Over 300 Associates across 9 Regional offices in United States, Canada, India, Japan & Mexico. We support clients in all US 7 ISOs and RTO's

Resources

11000 MW assets under
Active Management

400 MW Energy Storage
assets under
Management

Awards and Recognitions



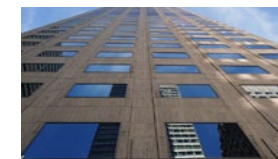
Inc. 5000 – Eleven Time Honoree, Philadelphia 100 - 2001, 2004 – 2012, 2019

Best Places to work: 2014, 2016

2016 Energy Storage Association Brad Roberts Award Winner

Clients

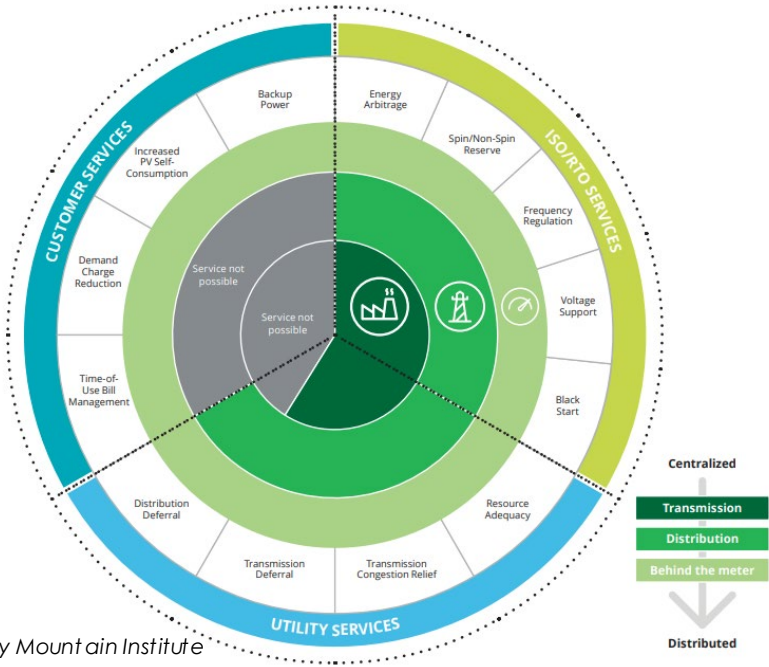
500+ Clients
Worldwide



Our consulting services enables competitive suppliers, technology providers, marketers, utilities and customers to prosper through change, by turning knowledge into value

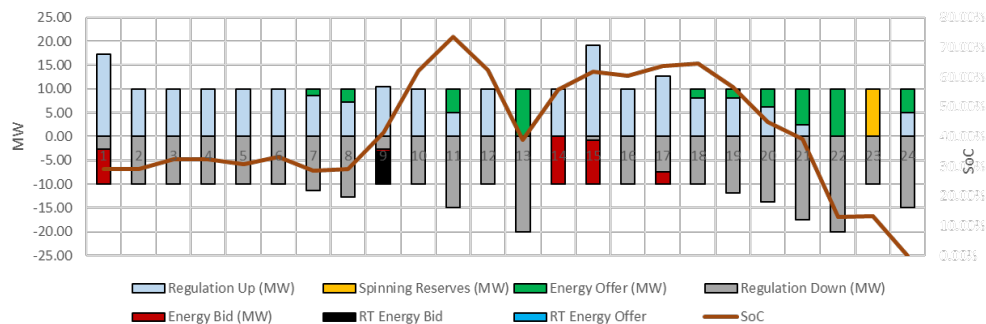
Storage Financing: Existing Global Scenario

Energy Storage Value Streams



Source: Rocky Mountain Institute

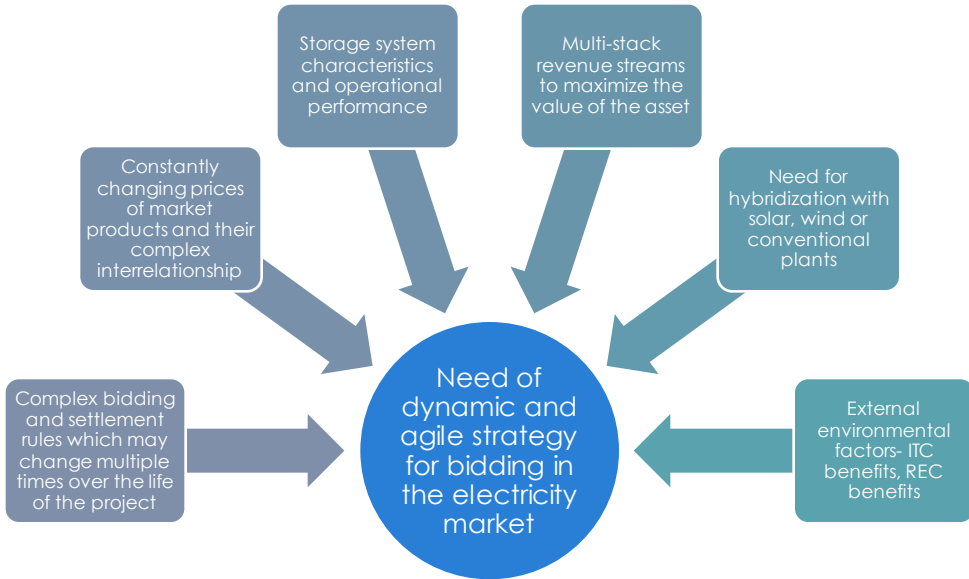
Sample Multi-stack Dispatch: CES GridBOOST Platform



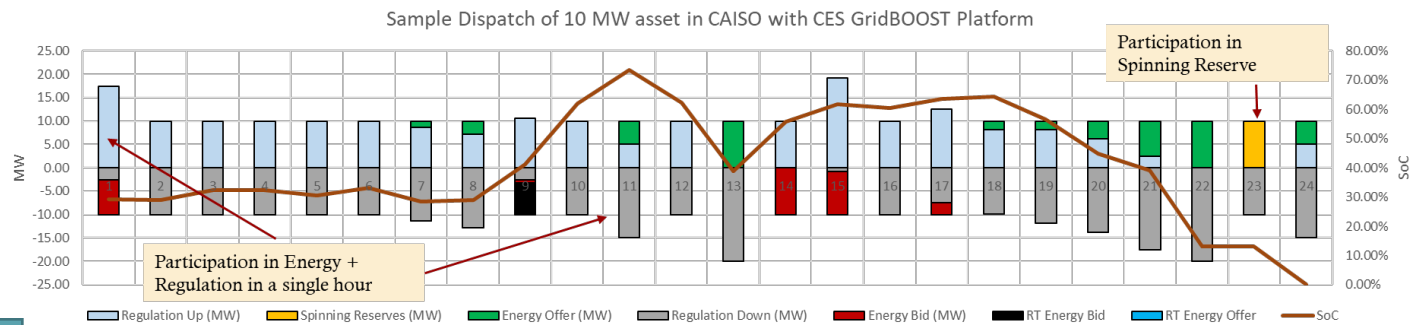
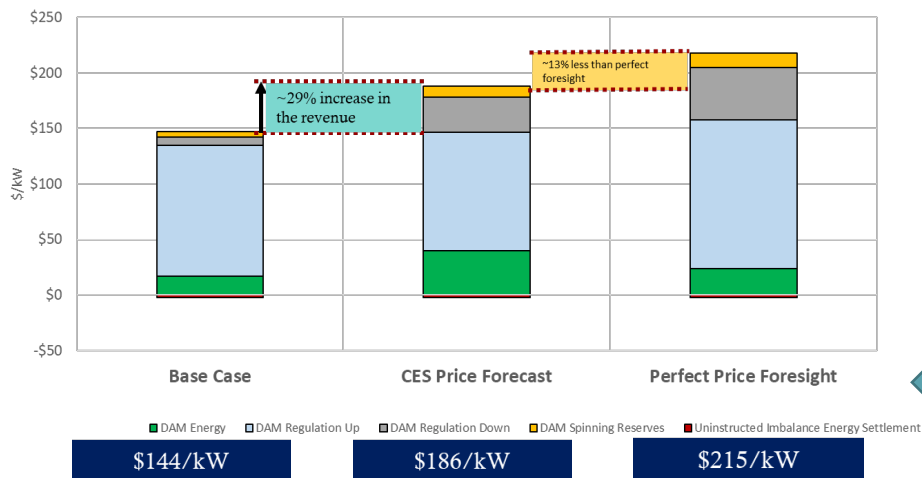
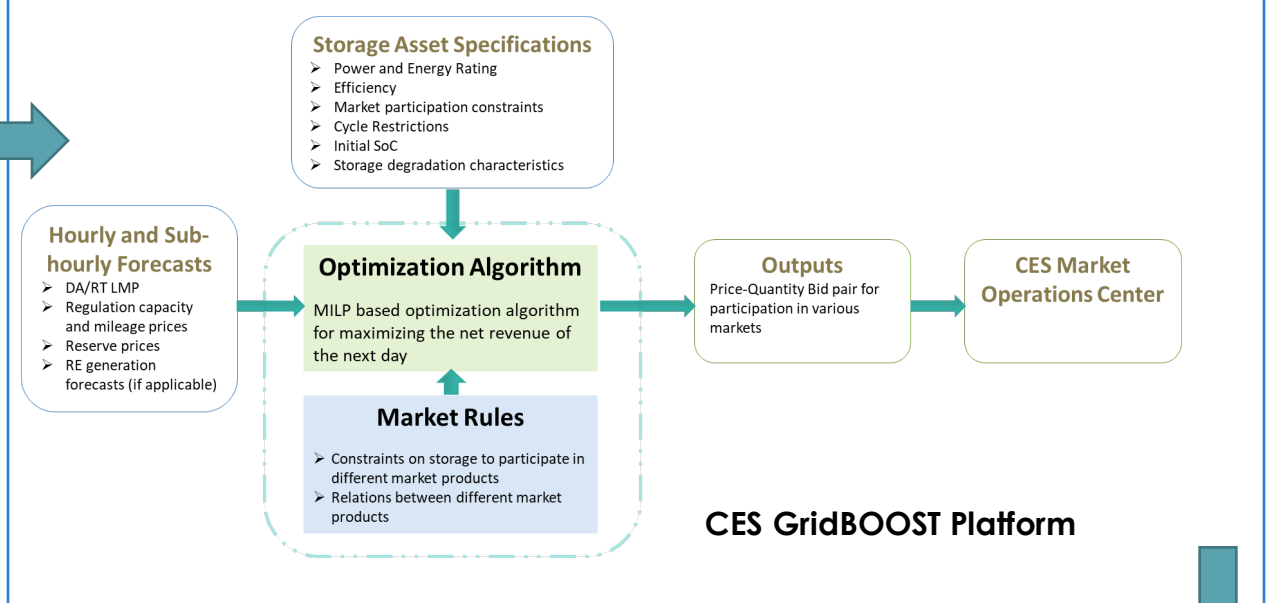
- Early storage projects were financed mainly through government funding or 100% equity. Merchant projects that provide frequency regulation service are still 100% equity funded
- With long-term utility contracts project financing is making its way to the storage industry
- Behind the meter assets are getting financing as an aggregated portfolio
- Need to capture multiple revenue streams to justify the economics. Operating strategies and controls are important to optimize the revenue
- Financing wind/solar plant with storage could be advantageous in terms of tax benefits
 - In US, wind or solar integrated storage qualifies for Investment Tax Credits (ITCs) if 75% or more charging is done through RE
- Regulatory support is needed. For example in US,
 - California state mandates of 1.3 GW of storage have created huge opportunity for storage.
 - FERC order 841 (issued in Feb 2018) removes barriers in ancillary service participation by recognising physical and operational characteristics of the resources
- Analytical software platforms will play a critical role in maximizing value of storage assets

Optimization Platform to Maximize Value of Storage Asset

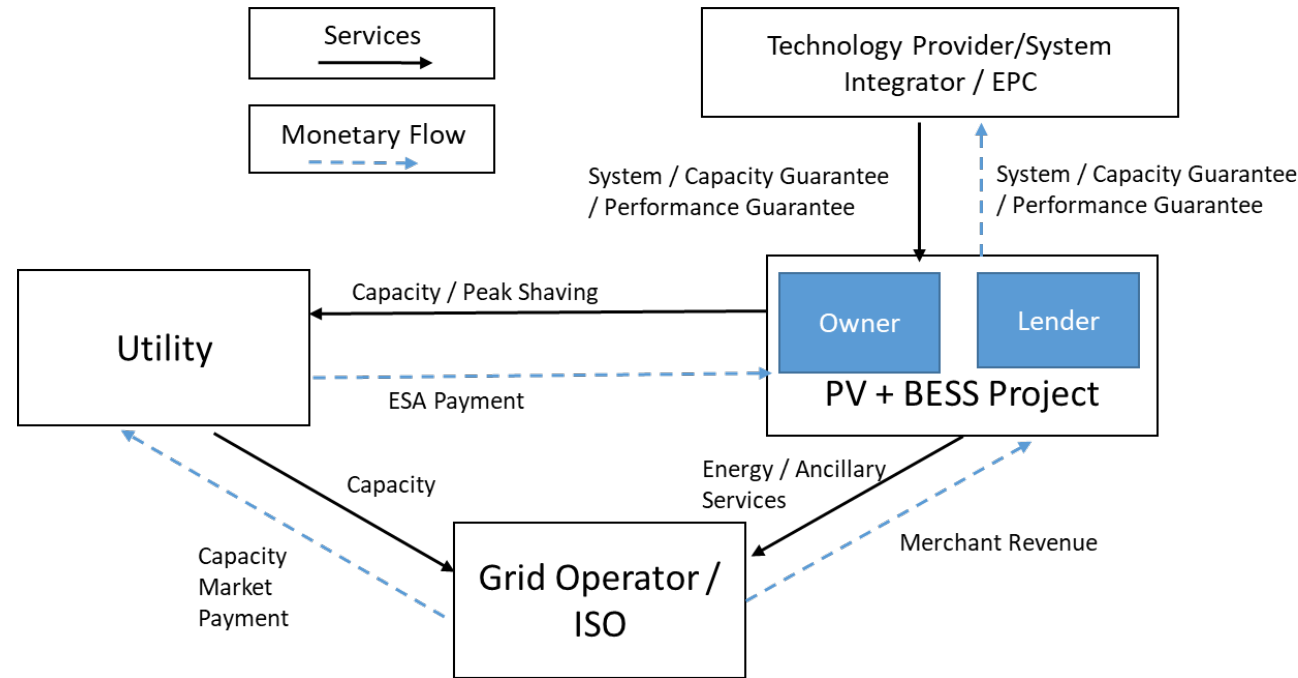
Why Optimization is Needed?



Bid Offer Optimization

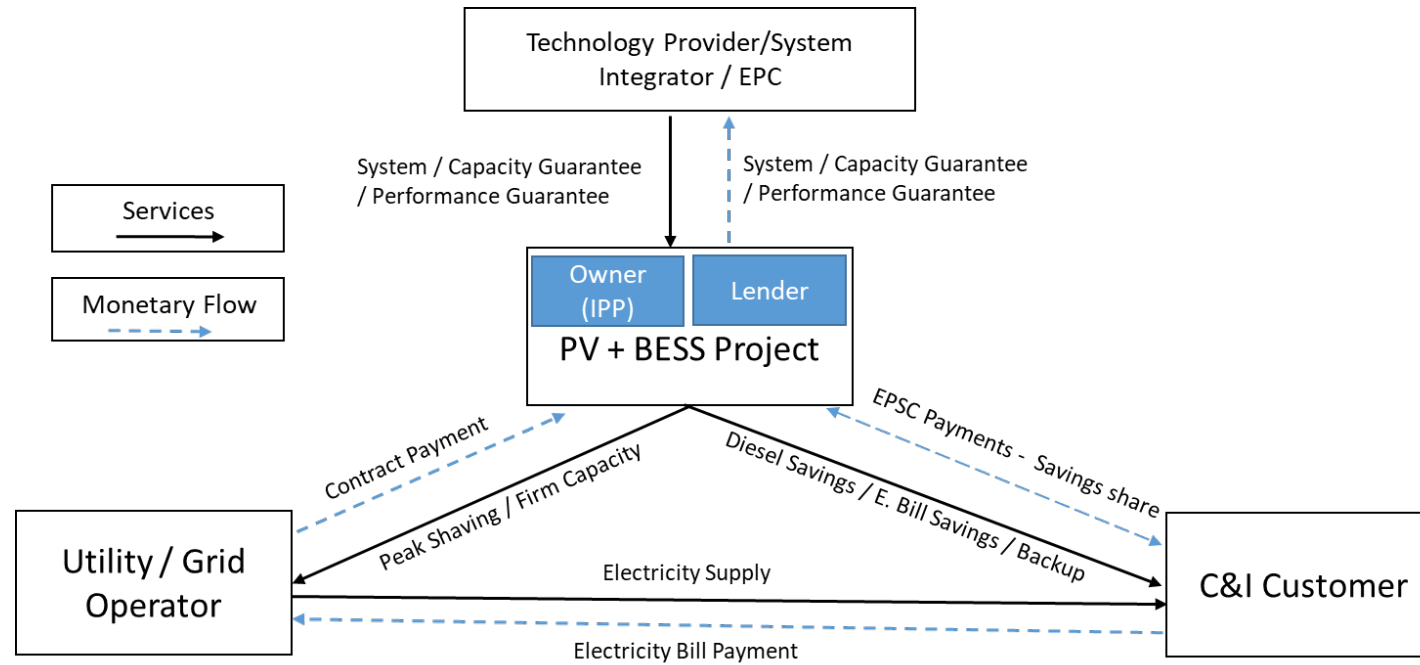


Business Models: Grid-connected Storage Projects



- Both utility-owned and third-party owned models are prevalent. Third-party owned models are getting the traction where utilities buy energy storage services
- *Energy Storage Agreement (ESA)*: The contract between project developer/owner and the utility. Utility procures one or more services.
- In majority of cases, project receives both contracted and merchant revenues. The utility acts as a hedge provider managing the merchant risk for the project

Business Models: Customer-sited Storage Projects



- *Utility Contract*: Requirements of Resource Availability during contracted Delivery Period. For BTM aggregated assets Demand Response Energy Service Agreement (DRESA) is prevalent in California
- *Energy Savings Performance Contract (ESPC)*: Contract is between project developer/owner and customer. Prevalent contracts in energy efficiency market.
 - Project developers usually arrange the third party financing, with the contract typically in the form of an operating lease
 - Useful for C&I customers with high demand charges
- Regulatory regimes impact the value of storage for the customer and the grid

Risks

- **Technology Risk:** Many storage technologies don't have long operating history and hence perceived as technology risk by financiers. This risk now has subsided for Li-ion batteries due to large installations but it still exists for many other technologies.
- **Regulatory Risk:** Energy storage participation rules in wholesale electricity markets are still evolving and pose risk of reduction in certain value streams. For example, tax credits.
- **Credit Risk:** Off-taker credit risk plays significant role in financing. Many utilities that floated energy storage RFPs have seen downgrades in credit ratings. These contracts are usually back-stopped by the state or other government entities.
- **Execution Risk:** Cost-over runs, permitting issues, delays in procurement and non-performance during operations all contribute to execution risk. Having the right team and right partnerships is key to reduce this risk.
- **Operational Risk:** Storage is energy-limited and acts as both generator and a load. These constraints create challenges in capturing multiple value streams. Sophisticated analytical platforms are needed to maximize the value of the assets

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