

# Energy storage seeks investors for cooperation

Should investors invest in energy storage technology?

For those who decide to invest, limited and declining revenue prospects could lead to competing strategies of energy storage investment and operation, where investors opt for technologies with specific technical attributes in the competitive market.

Can energy storage be a strategic investment under competition?

These market dynamics serve as a motivation for this study to understand strategic investments in energy storage under competition, taking into account storage impact on the market price. Our work uses energy arbitrage as a test case with the intent to explore additional services in the future.

Are investors allowed to deploy different energy storage technologies?

Investors are allowed to deploy different energy storage technologies. Analytically, we show that an increasing number of investors will increase the market competition thereby reducing profits while increasing the total capacity of storage deployed.

Can multiple energy storage investors invest in heterogeneous storage technologies?

Our work studies the strategic investment behavior among multiple energy storage investors in CAISO. These investors can choose to invest in heterogeneous storage technologies. At the beginning of an investment horizon, each investor decides the invested energy and power capacities.

How does energy storage work?

First, energy storage usually has a low operation cost since no fuel is directly consumed. Then, the profit-seeking investors will always charge the storage at the lowest prices during the day. To get non-negative revenue, the investor's cost from charge must be no higher than the market revenue from the discharge (at high prices).

How are storage investors' decisions coupled?

The storage investors' decisions are coupled due to the market price  $p(x)$ . In this section, we will introduce a linear model for the price based on the aggregate storage operation of all the investors. Then, we use historical data from the CAISO day-ahead market to characterize such a linear price function.

### 3.1. Model of market price function



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Web: <https://solarcomplete.co.za/contact-us/>

Email: [energystorage2000@gmail.com](mailto:energystorage2000@gmail.com)

WhatsApp: 8613816583346

