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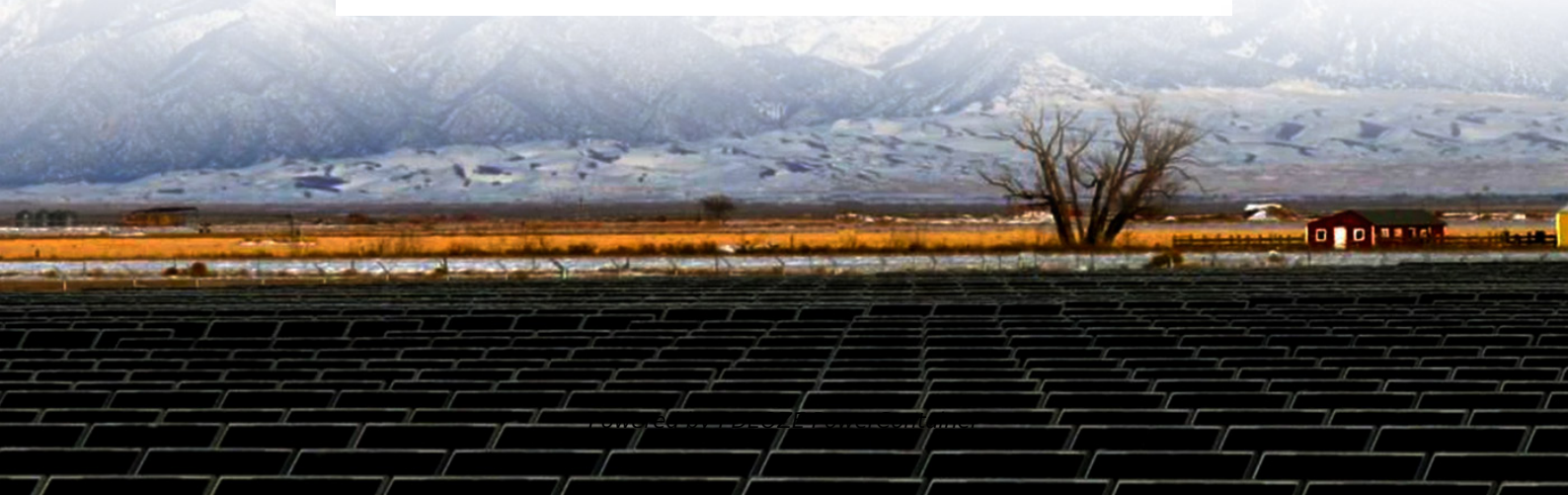
Solving the problem of peak and valley electricity prices with energy storage batteries



Overview

How are peak-to-Valley electricity prices optimized?

This period is divided into valley periods, and the rest of the period is divided into regular periods. According to the net load, the peak-to-valley electricity price periods are further optimized, and the optimized electricity prices for valley, flat, and peak periods are 0.28 RMB/kW·h, 0.42 RMB/kW·h, and 0.91 RMB/kW·h, respectively.

What happens if the peak-valley electricity price difference decreases?

As the peak-valley electricity price difference, annual average irradiance and annual average wind speed decrease, the optimal allocation capacity and the annual net revenue of the BESS also decrease.

Does energy storage affect peak-shaving cost?

On the other hand, references [35, 36] do not consider the impact of energy storage utilizing peak and off-peak electricity price arbitrage on the peak-shaving cost of the power system, thus failing to fully utilize the peak-shaving capabilities of energy storage.

How much does electricity cost in a valley?

Table 1 shows the peak-valley electricity price data of the region. The valley electricity price is 0.0399 $/kWh, the flat electricity price is 0.1317 $/kWh, and the peak electricity price is 0.1587 $/kWh. The operation cycles (charging-discharging) of the Li-ion battery is about 5000–6000.

How can electricity price optimization improve system response speed?

p>To address the issues of high energy costs and inadequate system response speed in complex electricity markets, we propose an electricity price optimization model. This model combines an improved Particle Swarm Optimization algorithm, Quantum-behaved Particle Swarm Optimization, and the Shuffle Frog Leaping Algorithm.

How does time-of-use electricity price affect energy storage?

To analyze this phenomenon, we can observe the charging and discharging periods of energy storage in Fig. 8, Fig. 11. The time-of-use electricity price makes the price gap between peak, flat and valley periods large, and has the role of guiding energy storage to “cut peak and fill valley”.

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