

450 kWh energy storage efficiency

The system integrated with a wind farm, energy storage system and the electricity users is shown in Fig. 1. The energy storage plant stores electricity from the wind generation and releases it to the load when needed. Electricity can also be transmitted directly from the wind farm to the load.

Schematic diagram of the integrated system

The electricity price is of three categories which are peak, mid-peak, and off-peak periods according to time-of-use (TOU) tariff. The operation strategy is that at off-peak time (low price), the energy storage system stores electricity; at on-peak time (high price), it releases electricity. Benefits are generated through the electricity price arbitrage.

where, $WG(i)$ is the power generated by wind generation at i time period, MW; $price(i)$ is the grid electricity price at i time period, \$/kWh; t is the time step, and it is assumed to be 10 min.

After energy storage is integrated into the wind farm, one part of the wind power generation is sold to the grid directly, and the other part is purchased and stored with a low price, and then is sold with a high price through the energy storage system.

The revenue from direct sales from wind farm to the grid without energy storage is calculated as follows:

The revenue from the energy storage system that sells electricity to the grid is calculated as follows:

Thus, the 1-year electricity sales revenue of storage integrated with wind farm is calculated as follows:

The energy storage system may provide spinning reserve service (charging and discharging processes) and non-spinning reserve service (still storage state) to the grid which pay for the service to the owner of the energy storage system. When charging, the spinning reserve capacity equals the current charging power value. When discharging, the spinning reserve capacity is calculated by subtracting the current discharging power (partial load) from maximum discharging power value. When still storage state, the non-spinning power equals the maximum discharging power of the energy storage system.

The additional revenue through spinning reserve service can be calculated as follows:

The additional revenue through non-spinning reserve service is calculated as follows:

Thus, the 1-year income by reserve ancillary service of energy storage system is calculated as follows:



450 kWh energy storage efficiency

Contact us for free full report

Web: <https://kary.com.pl/contact-us/>

Email: energystorage2000@gmail.com

WhatsApp: 8613816583346

