

# It is difficult to implement profit sharing for energy storage equipment

Can multiple buildings share energy storage and grid price arbitrage?

Abstract: This paper studies an energy storage (ES) sharing model which is cooperatively invested by multiple buildings for harnessing on-site renewable utilization and grid price arbitrage. To maximize the economic benefits, we jointly consider the ES sizing, operation, and cost allocation via a coalition game formulation.

Are shared energy storage systems effective?

In fact, shared energy storage systems can be an effective way to increase the efficiency and reliability of the energy system, regardless of whether consumers have their own PV systems or not. Comparing Figs. 4 and 5 demonstrates that CSES decreases the injecting power of consumers into the local grid.

Does a shared storage system have a complementarity of power generation and consumption?

In this context, considering the complementarity of power generation and consumption behavior among different prosumers, this paper proposes an energy storage sharing framework towards a community, to analyze the investment behavior for shared storage system at the design phase and energy interaction among participants at the operation phase.

Can shared energy storage improve the community's economic benefits?

It is worth mentioning that the shared energy storage mechanism can improve the community's economic benefits at any confidence level. Fig. 15. Energy storage investment decisions and the total cost under different confidence level. 5.7. Sensitivity analysis

Is shared energy storage a good investment plan?

However, there are few studies on the investment planning of shared energy storage. Under the storage sharing mode in which users invest in storage equipment individually and share their idle storage capacities within the community, the optimal energy storage size is determined by the genetic algorithm.

What is community shared energy storage (CSES)?

Community shared energy storage (CSES) is a solution to alleviate the uncertainty of renewable resources by aggregating excess energy during appropriate periods and discharging it when renewable generation is low. CSES involves multiple consumers or producers sharing an energy storage system.

A new energy storage system known as Gravity Energy Storage (GES) has recently been the subject of a number of investigations. It's an attractive energy storage device that might become a viable alternative to PHES in the future [25]. Most of the literature about gravity energy storage emphasizes on its technological capabilities.

The growing penetration of non-programmable renewables sources clearly emphasizes the need for enhanced flexibility of electricity systems. It is widely agreed that such flexibility can be provided by a set of specific

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technological solutions, among which one in particular stands out, i.e. the electrical energy storage (EES), which is often indicated as a ...

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Large-scale mobile energy storage technology is considered as a potential option to solve the above problems due to the advantages of high energy density, fast response, convenient installation, and the possibility to build anywhere in the distribution networks [11]. However, large-scale mobile energy storage technology needs to combine power ...

The large-scale development of energy storage began around 2000. From 2000 to 2010, energy storage technology was developed in the laboratory. Electrochemical energy storage is the focus of research in this period. From 2011 to 2015, energy storage technology gradually matured and entered the demonstration application stage.

Given the profound integration of the sharing economy and the energy system, energy storage sharing is promoted as a viable solution to address the underutilization of energy storage and the challenges associated ...

Photovoltaic charging stations are usually equipped with energy storage equipment to realize energy storage and regulation, improve photovoltaic consumption rate, and obtain economic profits through "low storage and high power generation" [3]. There have been some research results in the scheduling strategy of the energy storage system of ...

The capacity types of energy storage products provided by manufacturers are limited, making it difficult for users to buy energy storage modules that precisely match with their load curves. As the purchase of energy storage is a one-time investment, the electricity load of user fluctuates annually, further complicating the matching process.

The work presented by Bozchalui et al. [13], Paterakis et al. [14], Sharma et al. [15] describe various models to optimize the coordination of DERs and HEMS for households. Different constraints are included to take into account various types of electric loads, such as lighting, energy storage system (ESS), heating, ventilation, and air conditioning (HVAC) where ...

Due to the flexibility of the energy storage sharing mode, a two-part price-based leasing mechanism of shared energy storage (SES) considering market prices and battery degradation is proposed to provide the short-term use rights of energy storage for the VPP in ...

**2.1 Microgrid Energy Trading Model.** Currently, microgrids operate in two main modes: a centralized purchasing and marketing model, and a self-produced and self-use model. In the first mode, agents (such as

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power grid enterprises or third-party operating companies) will purchase all the power generated by Distributed Generation (DG).

Roughly speaking, the aim of the profit sharing scheme is to provide a method to share this surplus profit between DERs. Rationally, the share of each DER in the total profit should be equal to or greater than its individual profit, i.e., the minimum share of each DER in the total profit is equal to its individual profit.

Due to the fluctuating renewable energy sources represented by wind power, it is essential that new type power systems are equipped with sufficient energy storage devices to ensure the stability of high proportion of renewable energy systems [7]. As a green, low-carbon, widely used, and abundant source of secondary energy, hydrogen energy, with its high ...

The existing energy storage applications frameworks include personal energy storage and shared energy storage [7]. Personal energy storage can be totally controlled by its investor, but the individuals need to bear the high investment costs of ESSs [8], [9], [10]. [7] proves through comparative experiments that in a community, using shared energy storage ...

More recently, many researchers have focused on energy trading between CESSs and prosumers. For example, [10] formulated a two-stage model for energy storage sharing between CESSs and prosumers, where CESSs decide the price of virtual storage capacity in the first stage and prosumers decide the capacities and charging/discharging power in the second ...

An economic configuration for energy storage is essential for sustainable high-proportion new-energy systems. The energy storage system can assist the user to give full play to the regulation ability of flexible load, so that it can fully participate in the DR, and give full play to the DR can reduce the size of the energy storage configuration.

The energy storage technologies provide support by stabilizing the power production and energy demand. This is achieved by storing excessive or unused energy and supplying to the grid or customers whenever it is required. Further, in future electric grid, energy storage systems can be treated as the main electricity sources.

With the advancements in wind turbine technologies, the cost of wind energy has become competitive with other fuel-based generation resources. Due to the price hike of fossil fuel and the concern of global warming, the development of wind power has rapidly progressed over the last decade. The annual growth rate has exceeded 26% since the 1990s. Many countries ...

In this regard, this paper introduces a storage sharing mode that the storage operator (SO) acts as an investor and provides virtual storage services for prosumers, which ...

With the exhaustion of energy resources and the deterioration of the environment, the traditional way of

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obtaining energy needs to be changed urgently to meet the current energy demand (Anvari-Moghaddam et al., 2017). Renewable energy (RE) will become the main way of energy supply in the future due to its extensive sources and pollution-free characteristics (Atia ...

To address these challenges, riding the wave of application diffusion in the sharing economy in many fields [13], ES sharing has emerged as a cost-effective and immediate solution to ameliorate the adjustment ability of existing resources [14]. Shared energy storage (SES) is a new ES investment concept in which multiple users jointly invest in and operate new ES ...

Storage sharing separates usage rights from ownership rights, enabling it to serve multiple end-users simultaneously, thereby reducing investment and usage costs . ...

The non-profit function of energy storage can benefit from the ancillary services market. The two-part tariff business model is a supplement to the electricity price model for energy storage. When the existing profit model is not clear, additional income can be obtained through the two-part tariff business model.

Energy storage sharing (ESS) has the advantages of efficient operation, safety, controllability and economic saving. Hence, this paper aims to promote the development of ...

Researchers have studied the integration of renewable energy with ESSs [10], wind-solar hybrid power generation systems, wind-storage access power systems [11], and optical storage distribution networks [10]. The emergence of new technologies has brought greater challenges to the consumption of renewable energy and the frequency and peak regulation of ...

To face these challenges, shared energy storage (SES) systems are being examined, which involves sharing idle energy resources with others for gain [14]. As SES systems involve collaborative investments [15] in the energy storage facility operations by multiple renewable energy operators [16], there has been significant global research interest and ...

The definition and classification of energy sharing in this paper are closer to that in ref. [], which divides the sharing economy activities into four categories (as what we did in Table 3) includes the sharing of energy ...

The increasing energy storage resources at the end-user side require an efficient market mechanism to facilitate and improve the utilization of energy storage (ES). Here, a novel ES capacity trading ...

Due to the cost inefficiency of the individual framework and the difficulty of applying this framework to the grid-scale ES, many studies have suggested the sharing ...

When delving into the domain of REs, we encounter a rich tapestry of options such as solar, wind, geothermal, oceanic, tidal, and biofuels. Each source is harnessed using specific methodologies, including photovoltaic

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solar panels, wind turbines, geothermal heat pumps, subsea turbines, and biofuel plants (Alhuyi Nazari et al., 2021). These technologies have ...

With the increasing diversification of participants in energy storage sharing, there is a growing demand among users for flexible sharing strategies that cater to their specific energy storage needs [15]. Furthermore, the escalating awareness of participants' privacy protection adds to the challenge of acquiring information [16]. As a consequence, individual decision-making by ...

In this context, considering the complementarity of power generation and consumption behavior among different prosumers, this paper proposes an energy storage ...

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