

Can thermal energy storage reduce peak-valley difference of energy consumption?

Introduction Thermal energy storage techniques have become a promising way to minimize the peak-valley difference of energy consumption. Latent thermal energy storage (LTES) is a major aspect of thermal energy storage due to its high thermal storage density, and it can maintain a constant temperature in the process of heat release .

Does the optimized device improve the heat storage performance?

Compared with the original device,the heat energy charged of the optimized device increases by 5.7% and the filling amount of PCM decreases by 7.4%,indicating that the heat storage performance of the optimized device has been improved.

How can a phase change heat storage device be evaluated?

For a phase change heat storage device,the melting-solidification processing can be evaluated by the melt fraction  $v$  quantity. The larger the value of melt fraction  $v$  at the end of the simulated heat charging process,the more PCM has melted and the more heat energy is stored,revealing a better heat transfer effect. 3.1.2.

What is latent thermal energy storage (LTES)?

Latent thermal energy storage (LTES) is a major aspect of thermal energy storage due to its high thermal storage density,and it can maintain a constant temperature in the process of heat release . Therefore,phase change materials have received an increasing level of attention and have been widely applied to various heating systems.

What is a phase change heat storage device (PCM)?

In the studies of Li et al. , , PCM was filled in cylindrical tubes and all tubes were immersed in HTF of the storage tank. The structure forms of phase change heat storage devices can be broadly divided into two categories: shell and tube structure as well as encapsulated PCM structure, but the former is more common.

Which module has a larger heat energy discharged-charged ratio?

As can be seen in Fig. 7,whether focusing on the comparison of a single day or the comparison of the mean value,module 2 has a larger heat energy discharged-charged ratio. This result was also affected by the connection mode between modules.

Users in industrial park can regulate their electric load autonomously. The system can smooth PV generation, and level peak-valley electric quantity. The system is benefit for energy storage, peak-shaving, valley-filling, and stabilizing intermittent RES generation. It is an important technology support for smart grid.

Li et al. (2018) considered how a heat storage device, like an electric boiler, could be used to increase the role of wind power; a case study verified the effectiveness of the proposed model. An energy-storage device is also

added to the heat supply system studied by Quan et al. (2014) as one part of peak dispatching system.

According to the new high-temperature solid heat storage system designed in this study, it can be seen from the following Figure 2 that the minimum load of the unit is effectively reduced under the condition of the ...

As a large number of wind turbines connected to the grid, the difficulty of peak regulation of the power system is becoming more and more difficult. Therefore, a large number of peak-shaving ...

a solid-state electric heating heat storage device was constructed, to demonstrate that this configuration could enhance the power system's ability to absorb WP as well as ...

In this study, by adding a high temperature heat storage device in the cold (hot) section of the reheating pipeline and taking the 300MW extraction steam turbine as the research object, it is ...

The exhaustion of fossil fuels and the aggravation of environmental pollution make the integrated energy system (IES) with clean and sustainable energy sources more applicable [1]. Vigorously developing an integrated energy system is an important measure to realize energy transformation and energy structure adjustment [2]. The IES, meeting the electricity, ...

Electric energy storage trading refers to the charge and discharge services provided by energy storage devices according to the needs of power system operation. The energy storage device accumulates electricity during the renewable energy abundant period and discharges during the load peak period.

As a device that can adjust the amount of electricity generated and received in real time, the gravity energy storage device is an effective way to solve the difficulty of peak regulation in the combined electric and heat system. According to the different operating characteristics of the power generation and reception of the gravity energy ...

Aiming at the coastal residential area, considering the natural characteristics of wind and photovoltaic energy, the supply characteristics of gas and electric energy, the energy consumption law of cold, heat and electricity and the complementary and coupling relationship of various energy sources and load, this paper studies the formation conditions and various ...

Thermal energy storage technology is an effective method to improve the efficiency of energy utilization and alleviate the incoordination between energy supply and demand in time, space and intensity [5]. Thermal energy can be stored in the form of sensible heat storage [6], [7], latent heat storage [8] and chemical reaction storage [9], [10]. Phase change energy storage ...

The utility model relates to a complex hot water tank of solar heating and peak-valley electric storage energy heating, and consists of a heat type water tank, a connecting tube, an on-off control valve, an electronic

heating apparatus as well as a final temperature hot water tank, wherein, the final temperature hot water tank is connected with the heat type water tank ...

In recent years, many scholars have carried out extensive research on user side energy storage configuration and operation strategy. In [6] and [7], the value of energy storage system is analyzed in three aspects: low storage and high generation arbitrage, reducing transmission congestion and delaying power grid capacity expansion [8], the economic ...

Pumped Thermal Electricity Storage or Pumped Heat Energy Storage is the last in-developing storage technology suitable for large-scale ES applications. PTES is based on a high temperature heat pump cycle, which transforms the off-peak electricity into thermal energy and stores it inside two man-made thermally isolated vessels: one hot and one ...

Store electricity during the "valley" period of electricity and discharge it during the "peak" period of electricity. In this way, the power peak load can be cut and the valley can be filled, and the user-side demand ...

Rong et al. [35] provided an auxiliary heat source by installing electric heating and heat storage devices to consume wind power during peak shaving; ... as the energy input and converts electricity into heat through electric heaters to meet the energy demand while achieving peak and valley reduction of electricity. To match the peak and valley ...

A peak-valley energy-saving electricity storage and charging device for a new energy vehicle, wherein a portable mobile box (1) thereof comprises a box body (11), movable ...

Furthermore, energy efficiency can be enhanced by 151.6 % compared to traditional TES device and operational cost can be decreased to 15.1 % of conventional electric heating system. The proposed energy-efficient HP-PCM system exhibits great potential for scalable and cost-effective space heating with energy storage.

Aiming at problems such as high operating costs, the low utilization efficiency of renewable energy, and the increase in the peak-valley difference in user load caused by disordered charging of electric vehicles (EVs), the operation mode of "setting electricity by heat" or "setting heat by electricity" is adopted in the integrated energy system of intelligent residential ...

Bear in mind that you'll probably have more than one storage heater to power. Using your storage heater's boost function adds to heating costs because it uses pricier daytime electricity, rather than stored heat. \* Based on ...

While the proportion of electric energy conversion devices has diminished, the energy supply of

corresponding cold and heat conversion devices such as HRSG, AC, and GSHP has grown. It is noticed that the involvement of energy storage equipments is more frequent in the park's peak and valley periods of energy consumption.

The embodiment of the invention provides an energy valley-peak energy storage and conversion device which comprises a shell, wherein a plurality of layers of heat exchange tube sets...

The electric heating device with thermal storage can store inexpensive thermal energy at night and release the heat for space heating during the daytime. Such electric ...

In addition, the application scenarios of energy storage devices have a greater impact on their configuration results, which can effectively solve the problems of supply and demand balance, peak shaving and valley filling, smoothing and absorbing and electric energy substitution. ... Due to the low price of heat/cold storage equipment and the ...

For electric heat storage heating systems, incorporating phase change heat storage devices can make full use of peak-valley pricing policy. Cost savings and peak load shaving ...

Li et al. (2018) considered how a heat storage device, like an electric boiler, could be used to increase the role of wind power; a case study verified the effectiveness of the proposed model. An energy-storage device is also added to the heat supply system studied by Quan et al. (2014) as one part of peak dispatching system. Their proposed ...

In this paper, on the basis of analysing the feasible domain in which the configuration of heat storage can expand the work of CHP plants, we will set up a heat supply ...

The traditional regulation method is difficult to meet future peak-shaving needs [5]. Virtual power plant (VPP) can aggregate distributed resources such as wind turbines, photovoltaic (PV) generators, controllable loads, and energy storage devices into an adjustable and easily controlled "equivalent power plant" through various advanced information and ...

In above studies, the terminal load is regarded as a constant. In fact, the cooling/heating/power loads in IES have flexible characteristics and good adjustability [15], and they can participate in demand response (DR) to reduce the peak-valley difference and the total cost of the system [16] is worth noting that the traditional DR is only focused on electric ...

The comparative study [7] found that the square PCM storage device has the advantages of simple packaging and high density per unit volume of heat storage. Therefore, a square plate type phase change heat storage structure is adopted in this paper, as shown in figure 1. Figure 1. PCM storage device

## Peak-valley electric heating energy storage device

The IES includes a variety of devices and energy conversion technologies. ... the formation of a load peak shaving trend enables a gentler optimized load curve. The peak-valley difference of electrical load and heat load decreased by 21.24% and 50.19%, respectively. ... heat, and energy storage into overall resources and realize the coupling of ...

The heating system consists of a heat source (CHP plants, electric heating and heat storage tank), heating network and radiators. In actual district heating, the secondary pipe network is smaller in size and has a shorter distance from the heat exchange station compared to the primary pipe network.

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