



# High temperature solar energy storage peak load regulation power station

Electric heat storage technology has broad prospects in terms of in-depth peak shaving of power grids, improving new energy utilization rates and improving the environment. It is an important ...

Downloadable (with restrictions)! Due to its inherent intermittency and fluctuation, renewable energy represented by solar energy is not friendly to the power distribution network and connect to the grid. The molten salt solar power tower station equipped with thermal energy storage can effectively compensate for the instability and periodic fluctuation of solar energy, and a ...

In spite of the discontinuous nature of solar energy, concentrated solar power (CSP) plant with thermal energy can not only stabilize output but also be operate. ... plant with thermal energy can not only stabilize output but also be operated as a peak load regulation plant in a multi-energy system. This work demonstrates the dynamic ...

The needed transition to an energy system based on 100% renewable electricity generation is accompanied with a number of challenges. Most prominently, the intermittent nature of the dominating renewable-energy techniques, wind and solar power, requires complementary measures to balance the electricity production and consumption over various time scales [1].

Besides, concentrated solar power (CSP) station integrated with thermal energy storage (TES) has been proved to be an ideal peak regulation approach to such a multi-energy system that includes wind and solar power [[6], [7], [8]]. For the intermittent fluctuation of renewable energy, as well as the feature of the peak shaving plant, the dynamic ...

With the same stored thermal energy to heat the bypassed feed water of 308.65 t/h, the power output can be increased to 394.2 MW from 360.07 MW (60% rated load) at the same sensible heat storage power factor of 0.2462 during the load raising process, and the coal-fired power plant can achieve the maximum deep peak shaving time of 9.86 h/d with ...

energy storage and electrical energy storage, thermal energy storage has obvious advantages in terms of installed capacity, energy storage density, technology cost, service life, etc., ( Huang et ...

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 ...

In recent years, with the rapid development of the social economy, the gap between the maximum and minimum power requirements in a power grid is growing [1]. To balance the peak-valley (off-peak) difference of the load in the system, the power system peak load regulation is utilized through adjustment of the output power and operating states of ...



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Thermal power plants are required to enhance operational flexibility to ensure the power grid stability with the increasing share of intermittent renewable power. Integrating thermal energy storage is a potential solution. This work proposes a novel system of molten salt thermal storage based on multiple heat sources (i.e., high-temperature flue gas and superheated ...

The development of large-scale, low-cost, and high-efficiency energy storage technology is imperative for the establishment of a novel power system based on renewable energy sources [3]. The continuous penetration of renewable energy has challenged the stability of the power grid, necessitating thermal power units to expand their operating range by ...

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In recent years, the impact of renewable energy generation such as wind power which is safe and stable has become increasingly significant. Wind power is intermittent, random and has the character of anti-peak regulation, while the rapid growth of wind power and other renewable energy lead to the increasing pressure of peak regulation of power grid [1,2,3].

Wang J, Zhao J, Ye X, et al. Safety constraints and optimal operation of large-scale nuclear power plant participating in peak load regulation of power system. IET Generat Transm Distrib 2017; 11: 3332-3340.

With a low-carbon background, a significant increase in the proportion of renewable energy (RE) increases the uncertainty of power systems [1, 2], and the gradual retirement of thermal power units exacerbates the lack of flexible resources [3], leading to a sharp increase in the pressure on the system peak and frequency regulation [4, 5]. To circumvent ...

The concept of using Thermal Energy Storage (TES) for regulating the thermal plant power generation was initially reported in [1] decades ago. Several studies [2, 3] were recently reported on incorporation of TES into Combined Heat and Power (CHP) generations, in which TES is used to regulate the balance of the demand for heat and electricity supply.

How high-temperature solar power plants work, ... The energy source in a high-temperature solar power plant is solar radiation. ... Arizona, about 70 miles (110 km) southwest of Phoenix, completed in 2013. It was the largest parabolic trough plant with molten salt storage when commissioned. It has a total capacity of 280 MW gross from two 140 ...

A CPS-based framework for controlling a distributed energy storage aggregator (DESA) in demand-side management is proposed and it is demonstrated that the algorithm achieves power tracking convergence within a fixed time, while asymptotically achieving SoC balancing when assuming a connected



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communication network among the storage units.

The study investigates the heat transport characteristics of the solar power tower station with thermal energy storage, which serves as a peak regulation source in the ...

The fast peak-load regulation capability of CFPP is the key. According to the available literature, the lowest load rate of thermal power plants is about 30 % [1] and the fastest load change rate is about 4.5 %/min [2]. However, some components of traditional steam Rankine cycle power plants, such as condensers, have large thermal inertia due to their large size and ...

Concentrated solar power (CSP) plant with thermal energy storage can be operated as a peak load regulation plant. The steam generation system (SGS) is the central hub between the heat transfer fluid and the working fluid, of which the dynamic characteristics need to be further investigated. The SGS of Solar Two power tower plant was selected as the ...

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Concentrated solar power (CSP) plant with direct molten salt storage plays an important role in future commercial projects for its high flexibility and reliability. To fully understand its thermodynamic performances and electrical characteristics under various meteorological conditions and load demands, an accurate dynamic model is essential. ...

Large-scale intermittent renewable energy grid-connected power generation requires thermal power units with sufficient flexibility to adjust resources, which can achieve deep peak regulation of 35% THA, and respond to load changes when intermittent renewable energy is connected to the grid in real time.

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The energy industry is a key industry in China. The development of clean energy technologies, which prioritize the transformation of traditional power into clean power, is crucial to minimize peak carbon emissions and achieve carbon neutralization (Zhou et al., 2018, Bie et al., 2020) recent years, the installed capacity of renewable energy resources has ...

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Keywords: thermal power plant, peak shaving, high temperature thermal energy storage, wind power



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accumulation 1. Introduction China's wind energy, solar energy and other renewable energy resources are abundant, suitable for large-scale development and utilization. As of 2018, the total installed capacity of wind power installed in the country

By using 15 h of TES and a higher temperature MS formulation, with heat transfer fluid hot temperatures of 700°C, and a power cycle 350 bar 700°C of efficiency 48%, ...

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