

Does virtual energy storage reduce the cost of electric-heat integrated energy system?

The results show that the operation optimization method considering the virtual energy storage of heat supply network will greatly enhance the complementary potential of the electric-heat integrated energy system and reduce the operation cost of the system.

What is a heat network virtual energy storage system?

During a scheduling period, if the heat source heat output is greater than (less than) the user's heat demand, the heat network virtual energy storage system plays an energy storage (or discharge) role, which is reflected by the return water temperature increases (or decreases) compared to the previous period.

What is virtual heating energy storage (vhes)?

References [1, 2] consider the energy flow transmission characteristics of the heating network and model it as virtual heating energy storage (VHES), where VHES can decouple the heating and electricity supplies to improve the renewable energy penetration levels of IES.

Why does IES use virtual heating energy storage?

Besides, the virtual heating energy storage stores 3.88 MWh of heating energy during 9:00-16:00 and 19:00-22:00. It is because the GT supplies much heating energy at these periods, so the redundant heating energy is stored provisionally and it is released during 1:00-7:00 to reduce the operating costs of IES.

What is the operation optimization model for electric-heat integrated energy system?

In this paper, based on the latency and virtual energy storage characteristics of the heating network, an operation optimization model for the electric-heat integrated energy system is established, which takes into account the dynamic characteristics of heat energy transmission:

Why do we need to model the dynamic processes of heat transport?

Modeling the dynamic processes of heat transport is key to reflect the latency and virtual energy storage characteristics of the heat network, which is helpful to the development of energy storage potential of the heat network and to participate in the optimal operation of electro-heat IES.

Heat distribution is generally obtained by using hot water or steam flowing through a closed network of insulated pipes and heat exchange stations at the users' locations ... S. Muyeen, Risk-constrained stochastic optimal allocation of energy storage system in virtual power plants. *J. Energy Storage* 31, 101732 (2020)
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Gas network Heat supply network Power grid to be built Gas network to be built Heat supply network Wind energy to be built resource area Solar energy resource area 500m 1500m Solid waste treatment park Chemical

industrial park 1500m Residential park Fig.3. Regional energy wide area network Park 1 is a solid waste treatment park. The only

The world is subject to increasingly serious energy scarcity and environmental issues caused by the consumption of fossil fuels [1], [2], [3], which has greatly incentivized energy providers worldwide to transform and upgrade energy infrastructure [4], [5]. At the same time, the development of various energy conversion devices and multi-energy flow coupling technology, ...

Zhu et al. [28] constructed a virtual joint energy storage system integrating power and heat storage, and integrated the VES model into the energy system scheduling model, whose joint VES system can not only arrange electric vehicle charging according to the vehicle driving rules, but also regulate the indoor temperature of the building within ...

Utilizing virtual energy storage technology to optimize energy at different periods without adding new energy storage facilities, peak-to-low system capacity requirements for damaging backup can

Managing the charging of EVs and heat storage of buildings, a joint virtual energy storage system including electric energy storage and thermal energy storage is proposed in this paper. Then ...

Integrated energy systems (IESs) are complex multisource supply systems with integrated source, grid, load, and storage systems, which can provide various flexible resources. Nowadays, there exists the phenomenon of a current power system lacking flexibility. Thus, more research focuses on enhancing the flexibility of power systems by considering the ...

Aiming at the problem of wind curtailment caused by the lack of system flexibility, an optimal scheduling strategy for improving the flexibility of the electricity-gas-heat interconnection system by the coordinated operation of the gas network management and storage characteristics and the heat storage characteristics of the heat network is proposed.

Based on the dynamic pipe-storage characteristics of natural gas network and the dynamic delay characteristics of heating network, this paper constructs an electric-gas-heat integrated energy ...

A virtual power plant is a system of distributed energy resources--like rooftop solar panels, electric vehicle chargers, and smart water heaters--that work together to balance energy supply and ...

The operation model of a virtual power plant (VPP) that includes synchronous distributed generating units, combined heat and power unit, renewable sources, small pumped and thermal storage elements, and electric vehicles is described in the present research. The VPPs are involved in the day-ahead energy and regulation reserve market so that escalate ...

As the dynamic process of heat energy transmission has a large time scale, the heat of hot water entering and flowing out of the pipeline is not simultaneously equal. The heat network can buffer energy and delay response. Thus, the virtual energy storage characteristics of heat network are similar to that of physical ESS.

Energy is the physical basis for human survival and a prerequisite for social development. Improving energy utilization efficiency, reducing carbon emissions, and achieving sustainable development is the only way for the future development of energy applications [1]. The grid-connected distributed energy systems (DESS) can realize the gradient utilization of ...

As the field of energy storage for IES continues to make significant progress, there is an increasing focus on leveraging flexible resources such as network-side dynamic characteristics and demand ...

1 Introduction. The core of achieving the "dual carbon" goal is to reduce carbon dioxide emissions. The integrated energy system (IES) uses clean energy and improves energy efficiency while reducing carbon emissions through multi-energy coupling, which plays a vital role in realizing the "dual carbon" goal and constructing a new energy system in China (Shen et al., 2022).

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