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The relationship between energy storage power stations and IDC

Overview

The study examines the role and applications of energy storage solutions in IDCs, including peak shaving, valley filling, and backup power supply mechanisms.What is a cyber-physical schematic of a power grid?

The cyber-physical schematic of a power grid integrated with multiple networked IDCs. The buses in the power grid are physical connection points that host IDCs, information nodes, and energy resources. The energy resources include BESSs, renewable energy sources, loads, dispatchable fossil fuel generators, and so on.

How much energy do IDCs use?

According to the United States Data Center Energy Usage Report (Ref.), IDCs in the U.S. consumed an estimated 70 billion kWh in 2014, accounting for about 1.8% of total U.S. electricity consumption. Ref. shows that the energy demand from IDCs in 2019 was around 200 TWh, comprising around 1% of global electricity use.

Should power utilities invest their own IDCs?

With deep integration of cloud computing in industrial systems, there is an emerging trend that power utilities invest their own IDCs (i.e. private IDCs that only provide access to grid stakeholders and other authorized parties) to provide cyber infrastructure support for grid operation.

How do we determine the capacity of cyber-physical resources in IDCs?

The model determines the capacity of cyber-physical resources in IDCs (servers, on-site BESSs, and renewable energy sources) through solving an optimization model that minimizes the IDC network’s investment, operation, and reliability costs. Ref. proposes a hierarchical planning framework for an IDC network.

Do data centers and smart grids have a coupling impact?

The coupling impact between data centers and smart grids thus becomes an important consideration. This paper proposes an integrated planning scheme that optimally determines the locations and capacities of interconnected Internet data centers and battery energy storage systems in a smart grid.

How can a networked internet data center improve quality of service?

The numerical case studies show that by properly utilizing the temporal-spatial load shifting flexibility of networked Internet data centers and coordinately planning the data centers’ and battery energy storage systems’ locations and sizes, the system’s quality-of-service, economics, and reliability can be significantly enhanced.

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