

# GIL AND ENERGY STORAGE AND DATA CENTERS



To further study, Drenkelfort et al. [83] integrated aquifer thermal energy storage (ATES) in data center to cut down cooling load demand of the cooling system (shown in Fig. 14). Aquifer water with seasonally stable temperature was utilized in the cooling system and no water container was needed. Case studies with mid-size data centers for



Energy costs are the fastest-rising cost element in the data center portfolio, and yet data center managers are still not paying sufficient attention to the process of measuring, monitoring



What the IRA means for data center energy storage. Traditionally, the government has tied tax credits for data center energy storage to the actual generation and capture of solar energy. It was a good system for companies with the resources and space to invest in the necessary solar technology a?? think tech giants in California with access to



The large energy consumption of DCs is an ongoing trend [21, 22]. There have been many studies focusing on the cost of green power usage [23, 24], and the improvement of renewable energy accommodation level of data centers has been a hot spot in recent years [25, 26]. Recent works find out that DCs' power consumption from the traditional power grid can be a?



There is room for many data center energy growth forecasts and scenarios. Billion dollar investments by Microsoft, AWS, Alphabet and other hyperscalers are being made in new data centers and new energy sources. The forecasted 160% data center energy demand growth by 2030 is creating opportunities for utilities, suppliers, and energy professionals.

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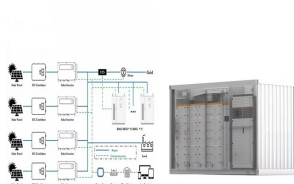
These challenges don't just increase the risk of downtime, but hinder growth, sustainability, and efficiency. Traditional UPS systems alone aren't enough to address these modern energy management needs. This whitepaper looks at how integrating Battery Energy Storage Systems (BESS) can revolutionize your data center's power infrastructure.



The company works with its customers and partners on energy systems for the future, thus supporting the transition to a more sustainable world. With its portfolio of products, solutions and services, Siemens Energy covers almost the entire energy value chain a?? from power generation and transmission to storage.



Goldman Sachs estimated that data centers' power demand from data centers will grow by 160% by 2030. Data centers consume 1-2% of overall power, but it could double up to 4% by 2030, with power consumption up to 200 TWh per year. Goldman Sachs also stated that AI could be responsible for 19% of all data center power demand by 2028.



The data center industry is heading toward a carbon-free (and even carbon negative) future, a goal that can only realistically be achieved in part through a renewed and refined focus on energy storage. The Evolution of Data Center Backup Energy. For decades diesel-powered generators have served as a primary backup power source to the public grid.



As the digital age progresses, the demand for data centers continues to surge, driving the need for more sustainable and efficient energy sources. Among the leading innovations is the potential use of hydrogen power to fuel data centers. This blog explores how hydrogen power works, the benefits it provides over traditional energy sources, the current a?|

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Cloud computing has revolutionized data storage, processing, and access in modern data center operations. Conventional data centers use enormous amounts of energy for server operation, power



Building on a series of congressionally mandated reports on data center energy use and efficiencies, DOE's Lawrence Berkeley National Laboratory (LBNL) is assessing current and near-future data center energy consumption and water use. solar energy, land-based wind energy, battery storage, and energy efficiency are some of the most rapidly



Fig. 1 shows that in a typical data center, only 30 % of the electricity is actually used by the functional devices, while 45 % is used by the thermal management system which includes the air conditioning system, the chiller, and the humidifier (J. Huang et al., 2019). When compared to the energy used by IT systems, the cooling system's consumption is significantly a?|



AI Data centers are large, energy intensive operations that often run 24 hours a day. Since 2016, their global power consumption has grown at an estimated 16% compound annual growth rate (CAGR). Jefferies projects this growth will continue through 2030, with US data center electricity consumption outpacing that of Europe and APAC (excluding



Modern data centers are usually highly occupied and, as a result, act as large energy consumers in power distribution systems. Taking the U.S. as an example, according to the United States Data Center Energy Usage Report [2], data centers in the U.S. consumed an estimated 70 billion kWh in 2014, accounting for about 1.8% of total U.S. electricity consumption.

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This creates valid use cases for the adoption of battery energy storage systems (BESS). In this paper we define what a BESS is, describe trends driving adoption, and explain its components, functions, use cases, and architecture considerations. We also provide guidance on what conditions most favor adopting Li-ion BESS for data center use.



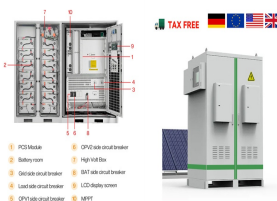
In Denmark, data centre energy use is projected to rise six times by 2030 to account for almost 15% of the country's electricity use. 1 IEA analysis based on Masanet et al. (2020), Malmudin (2020), Hintemann & Hinterholzer (2022) and reported energy use a?|



Here is a quick overview of each of these options and what they can mean for data centers. Solar energy. Solar energy for data centers involves the installation of photovoltaic (PV) solar panels to capture sunlight and convert it into electricity. Smaller data centers may simply put panels on their roofs or in adjacent areas.



The COP27 UN Climate Change conference saw nearly 200 countries reaffirm their commitment to limit global temperature to rise to 1.5°C (2.7°F) above pre-industrial levels.. That said, the world is perilously off course to keep this limit within reach and a bleak report published by the UN Climate Change shows current pledges put us on track for a 2.5°C a?|



These procedures are supporters of green cloud computing, which are focused on planning and advancing energy-efficient activities to contain inordinate energy utilization in data centers.

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Data Centers require enormous amounts of electrical energy to operate. The resultant emissions in the form of heat, directly, and carbon, indirectly, are cause for concern among Data Center managers and owners. In the past, and in many contemporary instances as well, Data Center managers have struggled to rein in large energy bills as operational activities a?]



While these conditions safeguard devices, the vast amounts of energy being used for the data storage comes at an environmental cost. How Much Energy Does Cloud Data Storage Use? Data centers use between 10 and 50 times as much power per floor space as a typical office building over the same period of time. The U.S. DOE estimates this to be



The Trend Toward Data Center Sustainability. Sustainability is a concept already embraced by many sectors and is now being progressively adopted by the data center and colocation industry. Data Center Frontier recently reported that cloud builders are deepening their commitment to green energy. Gil Santaliz, the President and CEO of the NJFX data a?]



Batteries are essential to keep data centers functional without power generation sources. Fortunately, technologies exist today, and more are on the way, to give data center operators peace of mind. Some large hyperscale data centers use between 20-100MW of power, with individual server racks growing in power output, upwards of 75-100kW.



Today, I'm excited to dive into a topic that lies at the intersection of cutting-edge technology and sustainable data center operations: Evolving Trends in Thermal Energy Storage with Thermal

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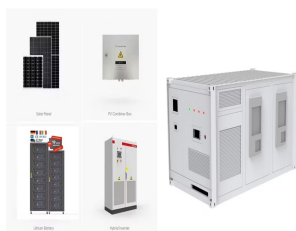
Microgrids and Energy Storage: Implementing microgrid systems and energy storage solutions enhances the resilience and reliability of data center operations while integrating renewable energy sources. By combining renewable energy generation with energy storage technologies such as batteries or flywheels, data centers can store excess energy



Net Zero Remains a Challenge. Jackson Metcalf, global leader of Gensler's critical facilities practice, says that while data centers consume significant energy, they do so far more efficiently than other commercial buildings. "Data centers are not wasteful consumers; they use every last bit of energy because it's costly," says Metcalf.



Green energy storage solutions like MAN MOSAS, MAN ETES, and Liquid Air Energy Storage (LAES) are vital for sustainable data centers and grid stability during the transition to renewable energy. MAN MOSAS uses molten salt for thermal storage, while MAN ETES provides heating, cooling, and electricity on demand.



As the backbone of cloud computing, IDCs are large energy consumers. According to the United States Data Center Energy Usage Report (Ref. [1]), 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. [2] shows that the energy demand from IDCs in 2019 was around 200 TWh, a?



Understanding battery energy storage . Many data centres already use batteries, mostly as a form of backup power, but often buy the cheapest lead-acid batteries available. By connecting larger-scale battery energy storage to on-site clean technology such as solar PV and the grid, it is possible to vastly increase access to renewably sourced