

How can wind energy be used digitally?

Develop a universal data standard: developing a universal and comprehensive data standard is the most important enabler of digital applications in wind energy today. This should cover new and old systems, their components and subcomponents and all wind development and O&M steps.

Does digital strategy affect firm energy storage innovation?

It is observed that the positive impact of digital strategy on firm energy storage innovation is much more significant in the regions and industries with higher convergence between digital and energy storage technologies.

How will digitalisation affect the cost of wind energy?

The costs of wind energy will continue to decrease thanks to new technologies e.g., rising turbine sizes, capacity factors and optimisation in developing and operating wind farms. The digitalisation of wind farm development, operation and maintenance (O&M) will be a major driver of cost reduction, better performance and lower financial risk.

How can the wind sector accelerate the momentum of digitalisation?

With that in mind, the wind sector needs to accelerate the momentum of digitalisation. This requires setting common definitions and wind energy digitalisation terminology and metrics. As it stands, universal definitions to describe major digitalisation applications and metrics to assess their benefits are both lacking.

What are digital applications in wind generation?

Digital applications are deployed to different stages and functionalities of wind generation, from wind turbine manufacturing and construction to system integration and wind farm O&M. Figure 2 illustrates major digital applications in wind farm O&M, wind turbine manufacturing and construction and a set of generic technology applications.

Does digital transformation affect energy storage innovation?

Table 3 shows the impact of digital transformation on energy storage innovation estimated by a negative binomial model. Our findings show that digitalization strategies have a significant positive impact on technological innovation in energy storage after controlling for years and industry fixed effects.

This study explores the influence of the Digital Economy (DE) on the Energy Trilemma (ET) across Chinese cities from 2008 to 2021. Leveraging an extensive panel dataset encompassing 276 cities, we constructed a city-level ET index, categorized cities using k-means clustering, and employed IV-GMM regression to scrutinize the impact of DE.

For China to reach its "dual carbon" aim, the digital economy presents both opportunities and obstacles. This paper examines the potential impact of digital economy development on regional carbon dioxide emissions, concluding that while the direct impact on regional carbon dioxide emissions through industrial structure upgrading and technological ...

In this work, we focus on long-term storage technologies--pumped hydro storage, compressed air energy storage (CAES), as well as PtG hydrogen and methane as chemical storage--and batteries. We analyze the systemic, energetic, and economic perspectives and compare the costs of different storage types depending on the expected full-load hours ...

This study explores the impacts of environmental pollution and the digital economy on the new energy industry with panel data on 30 Chinese provinces from 2005 to 2020. Mean group regression was performed, and fully modified OLS and dynamic OLS were conducted to check the robustness of the results. The authors reached two conclusions: (1) ...

In order to improve the operation reliability and new energy consumption rate of the combined wind-solar storage system, an optimal allocation method for the capacity of the energy storage system (ESS) based on the improved sand cat swarm optimization algorithm is proposed. First, based on the structural analysis of the combined system, an optimization ...

Concepts of Digital Economy and Industry 4.0 in Intelligent and information systems. ... my observations integrate more computing energy compared to Apollo 11 mission in the moon, this implies constantly decreasing prices for a particular segment of the IT storage and power. Similarly, it might be the case of IT-based services that also ...

The concept of the digital economy originates from the book *The Age of the digital economy* by ... strong wind, and large solar and wind power generation, such that these provinces have a high level of energy economic development. ... it can be seen that the impact coefficient of digital economy on energy economy is 0.2141 in the multiple ...

Renewable energy not only helps to safeguard the environment and slow down climate change but also supports economic growth and energy security. The significance of renewable energy sources is expanding as more people throughout the globe understand how important it is to switch to clean energy sources. Therefore, empirics are in search of the ...

This suggests that the digital economy has accelerated the integration and interaction of digital technologies with solar, wind, and biomass energy and reduced transaction costs, thus promoting technological innovation in renewable energy.

The emergence of e-commerce, digital technology, and the internet have all contributed to a revolutionary

shift in the global landscape toward the digital economy, which is driving inventive development on a global scale. Simultaneously, China's digital economy has entered a phase of high-quality development and has become a key driver of the global ...

Using, reusing, recycling, and remanufacturing wind turbine materials will reduce waste and create a "circular economy." A circular economy for energy materials also means that technology should be engineered from the start to require fewer materials, resources, and energy while lasting longer and having components that can easily be broken down for use in ...

This paper presents a concept of multi-purpose Battery Energy Storage System (BESS) which is integrated into a large wind farm (WF). The BESS aims to suppress the fluctuation of the output of active power and reactive power of the wind farm WF, participate in frequency regulation and damp low-frequency oscillations.

This paper examines the impact of the digital economy on sustainable development, using panel data from cities at the prefecture level and above in China from 2011 to 2019. The results indicate: (1) The digital economy is conducive to boosting growth, increasing employment, reducing energy consumption, and cutting emissions, thereby promoting ...

The book has 20 chapters and is divided into 4 parts. The first part which is about The use of energy storage deals with Energy conversion: from primary sources to consumers; Energy storage as a structural unit of a power system; and Trends in power system development.

This article aims to analyze the interplay between the digital economy (DE) and the real economy (RE), examining how they impact each other in terms of empowerment and supply effects. The study object is China from 2011 to 2021. This study applies the panel vector autoregressive model (PVAR). The study's findings underscore a delayed empowerment effect ...

Bloomberg New Energy Finance's (BNEF) "net zero hypothesis" points out that to achieve the goal of keeping the global temperature rise within 2°C set by the Paris Climate Agreement, it means that by 2050, global solar, wind energy, and battery energy storage will need to invest 15.1 trillion US dollars, and power grid will need to invest ...

It has been successfully applied in housing leasing, like Airbnb, and transportation industries, like Uber. Based on the combination of sharing economy and electric energy storage technology, Kang et al. proposed the concept of Cloud Energy Storage (CES) in 2017 [10]. CES is a shared energy storage technology that enables users to use the ...

The concept of digitalization has become a common practice for adoption and integration across the economy in recent years. The rapid prospects of a spillover from digitalization quickly became the interest of countries and researchers, especially in the interest of sustainable development based on the SDGs of the United

Nations. With several subsectors ...

The digital economy has been remarkably fueling the sustainability of renewable energy worldwide. However, how it accelerates renewable energy development, particularly renewable energy innovation, remains unknown. In a panel of 65 countries from 2002 to 2019, this research applies a dynamic panel model to explore the relationship between the digital ...

Rapid advancements in digital technologies have accelerated global change, underscoring the critical role of resilience in addressing the escalating energy, economic, and environmental challenges. This paper investigates the effects and mechanisms of the digital economy on energy, economic, and environmental resilience within the context of these ...

Decade of Digital Computing ... electricity within three decades was economically and technically feasible--and solar and wind could account for a significant fraction of that. ... Evaluation of Lithium-ion batteries program out of the DOE Vehicle Technologies Office Energy Storage Program demonstrated new, more efficient techniques to ...

Based on the concept of moderating effects in Baron and Kenny (1986), ... Second, although the direct impact of the digital economy on energy transition is negative, it plays a significantly positive moderating role in the process of AI's impact on energy transition. ... The need for continued innovation in solar, wind, and energy storage ...

The development of digital economy (Dig) promotes the development of green economy and the progress of ecological civilization. Based on the panel data of China from 2010 to 2020, this paper constructs the relevant index system and analyzes the impact of the Dig on environmental pollution (EP) by using a variety of econometric models. Subsequently, ...

Chapter 2 - Electrochemical energy storage. Chapter 3 - Mechanical energy storage. Chapter 4 - Thermal energy storage. Chapter 5 - Chemical energy storage. Chapter 6 - Modeling storage in high VRE systems. Chapter 7 - Considerations for emerging markets and developing economies. Chapter 8 - Governance of decarbonized power systems ...

In this context, the role of the digital economy is becoming increasingly significant, especially regarding the energy structure transformation of, and reduction in, energy consumption, which is essential in order to promote low-carbon transitions and achieve the goal of carbon neutrality.

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