

# Current status of energy storage patent research

How many patents are there in gravity energy storage?

The paper data utilized in this research was extracted from the Clarivate Analytics company's WoS Core Collection database (SCI-Expanded). The search strategy was based on the association of keywords related to gravity energy storage. By June 2023, 1166 patents and 82 SCI papers were retrieved.

Can energy technology research lead to a more mysterious energy future?

By pointing the way to these futures, researchers can create new breakthroughs in the use of energy storage solutions and take a step towards a more mysterious energy future. Investing in energy technology research efforts in storage also results in relentless convergence and promising opportunities.

Is energy storage a new technology?

Energy storage is not a new technology. The earliest gravity-based pumped storage system was developed in Switzerland in 1907 and has since been widely applied globally. However, from an industry perspective, energy storage is still in its early stages of development.

Do energy storage technologies drive innovation?

As a result, diverse energy storage techniques have emerged as crucial solutions. Throughout this concise review, we examine energy storage technologies role in driving innovation in mechanical, electrical, chemical, and thermal systems with a focus on their methods, objectives, novelties, and major findings.

How do energy storage technologies affect the development of energy systems?

They also intend to effect the potential advancements in storage of energy by advancing energy sources. Renewable energy integration and decarbonization of world energy systems are made possible by the use of energy storage technologies.

Why should we study energy storage technology?

It enhances our understanding, from a macro perspective, of the development and evolution patterns of different specific energy storage technologies, predicts potential technological breakthroughs and innovations in the future, and provides more comprehensive and detailed basis for stakeholders in their technological innovation strategies.

With the rise in new energy industries, electrochemical energy storage, which plays an important supporting role, has attracted extensive attention from researchers all over the world. To trace the electrochemical energy storage development history, determine the research theme and evolution path, and predict the future development directions, this paper will use ...

The concept of seasonal thermal energy storage (STES), which uses the excess heat collected in summer to

make up for the lack of heating in winter, is also known as long-term thermal storage [4]. Seasonal thermal energy storage was proposed in the United States in the 1960s, and research projects were carried out in the 1970s.

As an efficient energy storage method, thermodynamic electricity storage includes compressed air energy storage (CAES), compressed CO<sub>2</sub> energy storage (CCES) and pumped thermal energy storage (PTES). At present, these three thermodynamic electricity storage technologies have been widely investigated and play an increasingly important role in ...

2 Status of research on conventional wave energy generation technology 2.1 Types and basic principles of wave energy generation. The Girard father and son in France were the first to be issued a patent for a wave energy conversion device in 1799 (Chen et al., 2020), and since then, patents on the conversion and utilisation of wave energy have increasingly ...

Appl. Sci. 2022,12, 9361 2 of 20 long-duration energy storage. CAES technology presently is favored in terms of projected service life reliability and environmental footprint.

Based on an extensive market survey, discussions with manufacturers, project reports and literature, an overview of the current status of alkaline, PEM and solid oxide electrolysis on the way to ...

Based on current price trajectories and a patent activity level of 444 patents per year using our model, battery prices will fall from 2016 to 2020 by 39%, which puts utility-scale battery storage ...

2020 (H2020), to the research, development and deployment of chemical energy storage technologies (CEST). In the context of this report, CEST is defined as energy storage through the conversion of electricity to hydrogen or other chemicals and synthetic fuels. On the basis of an analysis of the H2020 project portfolio

With the development of society, the demand for energy has significantly increased, and the hydrogen energy industry is an important engine for optimizing energy structure and promoting the transformation of traditional energy. Hydrogen energy is a clean and renewable energy source with abundant sources. The unit mass of hydrogen contains a large ...

Download scientific diagram | Patent Overview of different energy storage technologies. from publication: Recent Advances in Carbon-based Nanomaterial for Multivalent-ion Hybrid Capacitors: A ...

In this paper, we identify key challenges and limitations faced by existing energy storage technologies and propose potential solutions and directions for future research and ...

Based on current price trajectories and a patent activity level of 444 patents per year using our model, battery prices will fall from 2016 to 2020 by 39%, which puts utility-scale ...

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The most popular flow field designs and design methodologies were explored here using scientific and patent sources. ... the total energy management, including the energy storage components, must be optimized and the operation of the PEMFC system must be improved. ... Current status and trends of the research and development for fuel cell ...

This paper introduces the electrical energy storage technology. Firstly, it briefly expounds the significance and value of electrical energy storage technology research, analyzes the role of electrical energy storage technology, and briefly introduces electrical energy storage technology, it focuses on the research status of energy storage technology in micro grid, distributed ...

Initially, a total of 89 patent files relevant to NM-based BESS were collected through an extensive evaluation using the LENS database to determine the current status. The patent documents ...

Current Situation and Application Prospect of Energy Storage Technology. Ping Liu 1, Fayuan Wu 1, ... analyzes the application status of energy storage technology, and prospects the application prospects of various energy storage technologies. ... Liu Na et al 2019 Research progress of all vanadium redox flow battery electrolytes [J] Power ...

Water electrolysis has various industrial applications. Over the past years, interest in water electrolysis technologies has increased largely due to the renaissance of the nuclear-hydrogen energy concept and also the prospect of the large-scale implementation of power plants based on renewable energy sources. The purpose of this paper is to present a ...

Advancing portable electronics and electric vehicles is heavily dependent on the cutting-edge lithium-ion (Li-ion) battery technology, which is closely linked to the properties of cathode materials. Identifying trends and prospects of cathode materials based on patent analysis is considered a kernel to optimize and refine battery related markets. In this paper, a patent ...

To elaborate on the current status of NEVs technology changes, text mining techniques are utilized to extract the implicit NEVs technology themes found within patent documents. ... also noted that the main challenges in developing HEVs are how to overcome the integration of energy storage devices with the electrical system and the ...

**2. CURRENT SITUATION OF ENERGY STORAGE INDUSTRY** 2.1 Status of global energy storage industry The theme of global carbon neutrality supports long-term energy storage demand, and new energy storage has broad prospects. It is expected that by 2030, the total global energy storage market will reach 1,164 GWH, with

Similar to Li-ion energy storage technology, Japanese companies (e.g., Panasonic Co., Ltd, Semiconductor

Energy Laboratory, and HITACHI) have the majority of patents in Zn-ion energy storage ...

The hydrogen energy industry, as one of the most important directions for future energy transformation, can promote the sustainable development of the global economy and of society. China has raised the development of hydrogen energy to a strategic position. Based on the patent data in the past two decades, this study investigates the collaborative innovation ...

Energy storage system (ESS) is recognized as a fundamental technology for the power system to store electrical energy in several states and convert back the stored energy into electricity when ...

According to research findings, the number of published patents related to different TES technologies increase every year. China, the United States, Japan, and South ...

Electrical energy storage systems have a fundamental role in the energy transition process supporting the penetration of renewable energy sources into the energy mix. Compressed air energy storage (CAES) is a promising energy storage technology, mainly proposed for large-scale applications, that uses compressed air as an energy vector. Although ...

Abstract. Currently, the main drivers for developing Li-ion batteries for efficient energy applications include energy density, cost, calendar life, and safety. The high energy/capacity anodes and cathodes needed for ...

Advanced Energy Materials is your prime applied energy journal for research providing solutions to today's global energy challenges. Abstract As the world races to respond to the diverse and expanding demands for electrochemical energy storage solutions, lithium-ion batteries (LIBs) remain the most advanced technology in the bat ...

Under the background of the power system profoundly reforming, hydrogen energy from renewable energy, as an important carrier for constructing a clean, low-carbon, safe and efficient energy system, is a necessary way to realize the objectives of carbon peaking and carbon neutrality. As a strategic energy source, hydrogen plays a significant role in ...

By summarizing the current status of CAES technology, the working principles, challenges, and solutions of different CAES technologies are analyzed, which is provided for the development of CAES technology through research. ... WANG S, ZHOU G, YU X Q, et al. Overview of research papers and patents on energy storage technologies [J]. Energy ...

Abstract Hydrogen is an ideal energy carrier in future applications due to clean byproducts and high efficiency. However, many challenges remain in the application of hydrogen, including hydrogen production, delivery, storage and conversion. In terms of hydrogen storage, two compression modes (mechanical and non-mechanical compressors) are generally used to ...

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The hazardous effects of pollutants from conventional fuel vehicles have caused the scientific world to move towards environmentally friendly energy sources. Though we have various renewable energy sources, the perfect one to use as an energy source for vehicles is hydrogen. Like electricity, hydrogen is an energy carrier that has the ability to deliver incredible amounts ...

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