

# Liquid flow energy storage patent

What is liquid air energy storage?

Concluding remarks Liquid air energy storage (LAES) is becoming an attractive thermo-mechanical storage solution for decarbonization, with the advantages of no geological constraints, long lifetime (30-40 years), high energy density (120-200 kWh/m<sup>3</sup>), environment-friendly and flexible layout.

What is the history of liquid air energy storage plant?

2.1. History 2.1.1. History of liquid air energy storage plant The use of liquid air or nitrogen as an energy storage medium can be dated back to the nineteenth century, but the use of such storage method for peak-shaving of power grid was first proposed by University of Newcastle upon Tyne in 1977.

When was liquid air first used for energy storage?

The use of liquid air or nitrogen as an energy storage medium can be dated back to the nineteenth century, but the use of such storage method for peak-shaving of power grid was first proposed by University of Newcastle upon Tyne in 1977. This led to subsequent research by Mitsubishi Heavy Industries and Hitachi.

What is a standalone liquid air energy storage system?

4.1. Standalone liquid air energy storage In the standalone LAES system, the input is only the excess electricity, whereas the output can be the supplied electricity along with the heating or cooling output.

Is liquid air more efficient than water in power recovery?

The use of liquid air as a storage medium as well as a working fluid in the power recovery step of the LAES technology is thermodynamically more efficient than water in terms of recovering low-grade heat as demonstrated in the next paragraph.

How efficient are flow batteries & pumped hydro storage?

Flow batteries and pumped hydro storage have a high (system-level) round-trip efficiency of 65%-85%.

The process for the generation of an unlimited duration energy storage of ammonia gas, liquid or mixed phase of gas and liquid is as follows: placing a carbon nanospoke catalyst which is doped with nitrogen, metals and actinides in a vessel; providing a source for nitrogen, water and water vapor into the vessel; providing a means for an ...

Illinois Tech spinoff Inluid Energy says it's coming out of stealth mode to commercialize a rechargeable electrofuel - a non-flammable, fast-refuelling liquid flow battery that already carries ...

ESS was established in 2011 with a mission to accelerate decarbonization safely and sustainably through longer lasting energy storage. Using easy-to-source iron, salt, and water, ESS' iron flow technology enables energy security, reliability and resilience.

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newatlas Inlufit moves to commercialize its ultra-high density liquid batteries By Loz Blain 8-10 minutes Illinois Tech spinoff Inlufit Energy says it's coming out of stealth mode to commercialize a rechargeable electrofuel - a non-flammable, fast-refuelling liquid flow battery that already carries 23% more energy than lithium batteries, at half the cost. Very much targeted at

A pumped hydro energy storage system and method are disclosed. The system employs a high-density fluid, such as a slurry, to improve power output. In some cases, the fluid is a binary fluid system, with a high-density fluid and a lower-density fluid, such as water. The lower-density fluid flows through the turbine unit of the system, avoiding the need to modify the ...

Patent Document 1 discloses an adiabatic compressed air energy storage (ACAES) power generation device that recovers heat from compressed air before storing the compressed air and reheats the compressed air when the stored compressed air is supplied to the turbine. Since the ACAES power generation device recovers the compression heat and uses the compression ...

GridStar Flow is an innovative redox flow battery solution designed for long-duration, large-capacity energy storage applications. The patented technology is based on the principles of coordination chemistry, offering a new electrochemistry consisting of engineered electrolytes made from earth-abundant materials.

The concept of using a liquid to compress a gas is not new and goes as far back as a patent by Christensen (1933), who presented a method aimed at achieving a compression process during which the temperature remains approximately constant, which saves energy. ... the hotter the water. Because of the high pressures required for air storage, the ...

An energy storage system according to claim 33, further comprising a thermostatic blending valve operable to blend inlet cold water with the potable water heated by the energy storage system to control outlet temperature of potable hot water; and optionally wherein the thermostatic valve is configurable to regulate outlet water temperature, and ...

New all-liquid iron flow battery for grid energy storage A new recipe provides a pathway to a safe, economical, water-based, flow battery made with Earth-abundant materials Date: March 25, 2024 ...

2016-07-15 Priority to US15/211,878 priority Critical patent/US20180017337A1/en ... FIG. 9 is a perspective view of a fluid flow plate of a thermal energy storage apparatus, ... Sodium acetate trihydrate has long been used as for supercooled liquid thermal energy storage in flexible heat packs for ready-to-use localized warming, for use as hand ...

Latest ELECTRIQ-GLOBAL ENERGY SOLUTIONS LTD. Patents: ... hydrogen generating system 10 may include a storage system 20 for storing a hydrogen liquid carrier. Storage system 20 may include a fuel tank 100 having several chambers ... liquid 1232 may flow from chamber 1220 into chamber 1202 via a conduit

1221.

Harvard has filed patents related to the breakthrough for "innovations in flow battery technology". The research was published in the journal ACS Energy Letters . This article was originally ...

3. The compressed air energy storage power generation device according to claim 1, further comprising: a water amount regulating unit configured to regulate a flow rate of the water flowing through the first heat exchanger; and

Iron-based flow batteries designed for large-scale energy storage have been around since the 1980s, and some are now commercially available. What makes this battery different is that it stores energy in a unique liquid chemical formula that combines charged iron with a neutral-pH phosphate-based liquid electrolyte, or energy carrier.

Our large-scale long duration hybrid energy storage systems, both the Optimized Liquid Air Energy Storage System and the Combined Gas and Electric Energy Storage (CEGS) System are based on the recently issued U.S. patent 11,598,261 "Re-Condensing Power Cycle for Fluid Regasification". A European patent application has been filed.

Turning to liquid air energy storage (LAES) or cryogenic energy storage, fewer patent applications are filed. The leading innovative companies are Xi'an Thermal Power Research Institute, The Technical Institute of Physics and Chemistry of the Chinese Academy of Sciences and Linde AG. Chart: Ben Lincon / Potter Clarkson

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Lithium-ion batteries are widely adopted as an energy storage solution for both pure electric vehicles and hybrid electric vehicles due to their exceptional energy and power density, minimal self-discharge rate, and prolonged cycle life [1, 2].The emergence of large format lithium-ion batteries has gained significant traction following Tesla's patent filing for 4680 ...

Liquid air energy storage (LAES) uses air as both the storage medium and working fluid, it falls into the broad category of thermo-mechanical energy storage technologies. ... Flow battery ...

Background. Element Digital Engineering was asked to review the future potential market and technologies in the field of energy storage on behalf of a customer and as part of an early business strategy development and investment decision-making process. The project focused on liquid flow batteries, specifically Vanadium Redox Flow Batteries (VRFB). The Challenge

In brief One challenge in decarbonizing the power grid is developing a device that can store energy from

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intermittent clean energy sources such as solar and wind generators. Now, MIT researchers have demonstrated a modeling framework that can help. Their work focuses on the flow battery, an electrochemical cell that looks promising for the job--except... Read more

It leverages the strengths of each energy source, optimizes power generation, ensures grid stability, and enables energy storage through energy storage pump stations. In the wind-solar-water-storage integration system, researchers have discovered that the high sediment content found in rivers significantly affects the operation of centrifugal ...

It is projected that China will deploy up to 4 GW of liquid flow batteries by 2025. Time Energy Storage. Established in 2021 and based in Suqian, Time Energy Storage is a technology company specializing in AOFB research and development. Its first-phase production line has an annual output of 2 GWh, covering the end-to-end production process of ...

A compressed fluid energy storage system includes a submersible fluid containment subsystem charged with a compressed working fluid and submerged and ballasted in a body of water, with the fluid containment subsystem having a substantially flat portion closing a domed portion. The system also includes a compressor and an expander disposed to ...

Electrolysers for hydrogen production. The 1.5°C Pathway report issued by the International Renewable Energy Agency (IRENA) predicts that hydrogen and derivatives will need to account for 12% of final energy use by 2050. Green hydrogen from water electrolysis using renewable energy is expected to be both a key strategic energy source and storage medium.

Electrochemical energy storage is one of the few options to store the energy from intermittent renewable energy sources like wind and solar. Redox flow batteries (RFBs) are such an energy storage system, which has favorable features over other battery technologies, e.g. solid state batteries, due to their inherent safety and the independent scaling of energy and ...

Liquid air energy storage (LAES) uses air as both the storage medium and working fluid, and it falls into the broad category of thermo-mechanical energy storage technologies. The LAES technology offers several advantages including high energy density and scalability, cost-competitiveness and non-geographical constraints, and hence has attracted ...

In addition, the present invention can operate as either a primary energy system or energy storage system in conjunction with a waste-water power generation system 310 that converts waste-water flow to electric power such as described in U.S. patent application Ser. No. 11/201,074, entitled "Waste Water Electrical Power Generating System ...

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