

Flow Batteries Market – Global Industry Size, Share, Trends, Opportunity, and Forecast, 2018-2028

Segmented By Type (Redox Flow Battery, Hybrid Flow Battery), By Material (Vanadium, Zinc–Bromine, and Others), By Storage (Compact Scale, Large Scale), By Application (Utilities, Commercial & Industrial, Military, EV Charging Station, Others), By Region and Competition

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Abstracts

Flow Batteries Market is expected to thrive during the forecast period due to the increase in end users, such as the utility industry and EV charging stations.

A flow battery is a rechargeable battery in which the electrolyte flows from one or more tanks through one or more electrochemical cells. In simple flow batteries, it is easy to increase the energy storage capacity by increasing the number of electrolytes stored in the tank. Electrochemical cells can be electrically connected in series or parallel to determine the performance of flow battery systems. This decoupling of rated energy and rated power is a key feature of flow battery systems.

As flow battery technology is modular and scalable, systems can be manufactured for a wide range of applications from wattage to megawatt ratings, with energy durations ranging from hours to days. Batteries can be constructed from inexpensive and readily available materials, such as thermoplastics and carbon-based materials. Many parts of the battery are recyclable. Since the electrolyte can be recovered and reused, running costs can be reduced. Battery materials are flame retardant and have a low environmental impact. Electrolytes can be used as part of a battery's thermal

management strategy, reducing the need for complex heating, or cooling of the battery system, thus, reducing costs. Electrochemical cells share a common electrolyte, allowing each cell to maintain the same state of charge, simplifying cell balancing and battery operation. One can measure the state of charge of the entire system at a single point (or use multiple measurement points to check if your battery system is functioning properly). Overcharging and over-discharging generally do not permanently damage electrodes or electrolytes. Self-discharge is limited in standby mode, no self-discharge when switched off. Energy storage capacity is independent of rating, so flow batteries are excellent for long-term energy storage. The overhead of increasing energy storage capacity reflects the cost of tanks and electrolytes, so the overall cost of long-life batteries is lower than other types of batteries.

The growing need for continuous supply in all major countries has increased the need for energy reserves. In the event of power outages or high demand, the flow battery acts as a backup power source. Flow is considered an alternative to Li-ion batteries and fuel cells. One of the features that set flow batteries apart from other alternatives is that they can be scaled up and recharged by simply adding the required amount of electrolyte. The functionality of flow batteries is highly adaptable as the used electrolyte can be recycled to the storage tank. Other advantages of flow batteries are their long service life and low maintenance. The demand for these batteries is growing with the introduction of renewable energy sources, such as solar and wind power, which negatively impacts the flow battery market.

Given the green energy targets set by several developed and developing countries, this trend is expected to continue around the world. Energy suppliers use flow batteries primarily for energy storage. Another advantage of utility-scale grid operation is the scalability of flow batteries. This allows the capacity to be increased by using more electrolytes. Along with another advantage of long service life and lifespan, this acts as a market driver for the global flow battery market. Flow battery installations are increasing worldwide as the use of solar and wind energy increases.

Expansion in Utility Industry Propels Flow Batteries Market

Due to their large and powerful properties, flow batteries are considered suitable for utility, commercial, and industrial customers, seeking long-term and long-term energy storage. These batteries are primarily used in utility applications as a buffer between power supply and power demand from the power grid. Flow batteries can reliably store and discharge electricity, allowing power companies to reduce excess power. In addition, utilities need batteries that are durable, robust, and long-lasting, capable of

supporting significant grid-wide penetration of renewable energy. The increasing demand for electricity in rural and urban areas has led to increased interest in grid improvements, which may lead to the introduction of flow batteries in utility applications.

Power outages, power supply interruptions, and machine downtime can all impact commercial and industrial applications, disrupting production lines, delaying shipments, and damaging products, significantly impacting business operations. An unexpected power outage at a particular location can last for a minute, an hour, a day, or even a week. Flow batteries are essential in such cases as they save energy costs in commercial and industrial operations while improving power quality and reliability. In addition, it reduces the chance of performance degradation during power outages and blackouts. Battery storage systems provide affordable, green power and facilitate the deployment of renewable energy systems that generate revenue through the sale of additional energy or grid stabilization services.

Utilities are one of the earliest application areas for flow batteries to address the penetration of renewable energy into the grid. Flow batteries are ideal for long-term discharge at commercial power levels in the MW range. They transfer energy and avoid blackouts during grid service interruptions. The majority of flow battery installation projects that have been performed around the world to date have served the needs of utility companies. Government and business organizations have recently upgraded their power grid infrastructure to meet the growing need for electrification in rural and urban areas. Given the increasing electricity demand, the governments of many countries are also investing heavily in the construction of power grids.

Latest Investments in Flow Batteries Market

In 2021, the U.S. Department of Energy (DOE) announced funding of USD 17.9 million for 4 research and development projects to enhance the manufacturing of flow batteries and long-term storage systems in the country. The funding is expected to provide the materials needed to expand the grid with new and clean energy sources, offer affordable electricity to disadvantaged communities, and achieve a net zero carbon footprint by 2050.

Using this investment, Largo Clean Energy and Partners (Wilmington, MA) were awarded USD 4.19 million to develop and demonstrate a highly efficient manufacturing process for affordable grid-scale flow batteries. TreadStone Technologies, Inc. and Partners (Princeton, NJ) were awarded USD 4.99 million for the development of roll-to-

roll technology for manufacturing metal electrodes and bipolar plates, essential components of flow batteries. OTORO Energy Inc. and Partners (Bloomfield, Colorado) were awarded USD 4.14 million to improve the cost, scalability, and performance of existing flow battery technology using a metal chelate flow battery system. Quino Energy, Inc., and Partners (Menlo Park, CA) were awarded USD 4.58 million to develop a scalable, low-cost continuous process to produce and run aqueous organic flow battery reactants.

In 2023, Singapore-based VFlowTech raised USD 10 million in Series A funding to set up a manufacturing facility and expand production of its 250-kWh vanadium flow battery product. The Series A funding round was led by Japanese VC Real Tech Holdings, with participation from existing investors, namely SEEDS Capital, Wavemaker Partners, Sing Fuels, and Michael Gryseels, the Chairman of VFlowTech. New investors include Inci Holding, Pappas Capital, and Carbon Zero Venture Capital.

VFlowTech plans to use this funding to establish a new manufacturing facility to build PowerCubes, a vanadium redox flow battery (VRFB) solution with an annual capacity of 200 MWh. The company has deployed its 30kWh and his 100kWh units primarily for residential applications and has now completed production of its MWh systems for large-scale microgrid applications. It will also use this capital to expand its market presence in Turkey (home of Inci Holding), the United States, Japan, and India with new partners, invest in R&D to improve technology, increase system capacity, and strengthen its management team.

Market Segmentation

The global flow batteries market is segmented on the basis of type, material, storage, application, and region. Based on type, the market is bifurcated into redox flow batteries and hybrid flow batteries. Based on material, the market is bifurcated into vanadium, zinc-bromine, and others. Based on storage, the market is bifurcated into compact scale and large scale. Based on application, the market is bifurcated into utilities, commercial & industrial, military, EV charging station, and others. Based on region, the market is bifurcated into North America, Asia-Pacific, Europe, South America, and the Middle East & Africa.

Market players

Key players in the global flow batteries market are Sumitomo Electric Industries, Ltd., Ess Tech Inc., RedFlow Ltd., Primus Power Corporation, Invinity Energy Systems Plc, Cellcube Energy Storage Systems Inc., Schmid GmbH, Stryten Energy Llc, EnSync, Inc., and Largo Inc.

Report Scope:

In this report, the global flow batteries market has been segmented into the following categories, in addition to the industry trends, which have also been detailed below:

Flow Batteries Market, By Type:

Redox Flow Battery

Hybrid Flow Battery

Flow Batteries Market, By Material:

Vanadium

Zinc–Bromine

Others

Flow Batteries Market, By Storage:

Compact Scale

Large Scale

Flow Batteries Market, By Application:

Utilities

Commercial & Industrial

Military

EV Charging Station

Others

Flow Batteries Market, By Region:

North America

United States

Canada

Mexico

Asia-Pacific

China

India

Japan

South Korea

Australia

Europe

Germany

United Kingdom

France

Spain

Italy

South America

Brazil

Argentina

Colombia

Middle East

Saudi Arabia

South Africa

UAE

Competitive Landscape

Company Profiles: Detailed analysis of the major companies present in the Global Flow Batteries Market.

Available Customizations:

With the given market data, Tech Sci Research offers customizations according to a company's specific needs. The following customization options are available for the report:

Company Information

Detailed analysis and profiling of additional market players (up to five).

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