

To Whom it may concern

RS Technologies Co.,Ltd
Prime Market (3445)

LE System: Growth of Vanadium Redox Flow Batteries Market and Competitive Advantage of LE System (Delay)

RS Technologies hereby announces growth of vanadium redox flow battery market and competitive advantages of LE System (Head office: Shinagawa-ku, Tokyo; CEO: Nagayoshi Ho) in the market as of July 2024.

■ Growth of stationary storage battery in global market

The global market for stationary storage batteries (Energy Storage System (ESS)) increased significantly in 2022 due to the strengthening of government subsidies and tax benefits for the introduction of renewable energy and ESS in major countries along with improvements in profits from sales of electricity.

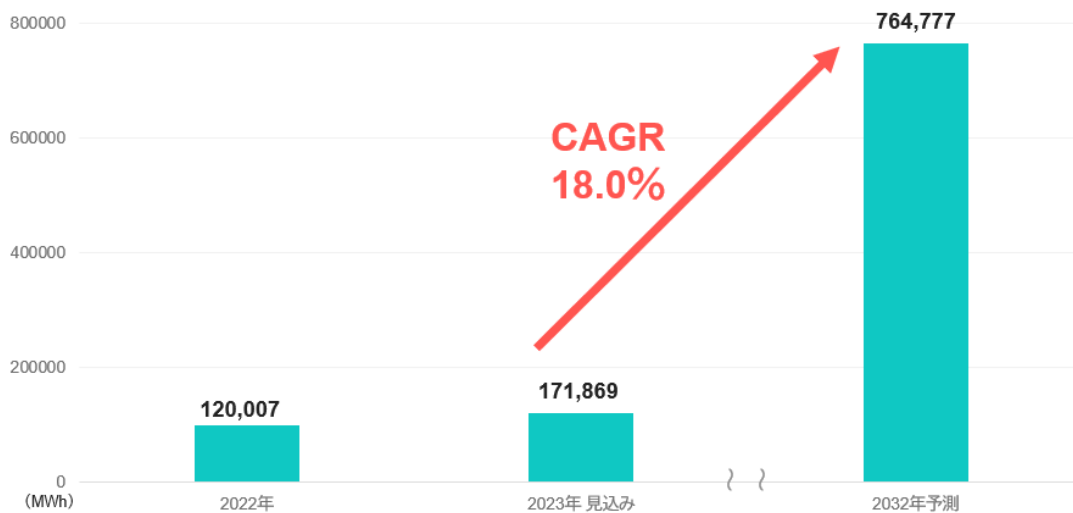
In 2023, driven by government's financial support for the introduction of ESS globally, the introduction of ESS increased in North America (mainly the United States), Europe and China in response to the construction of renewable energy power generation facilities, (※1)

In order to achieve carbon neutrality, the demand of ESS are expected to increase in 2024 and beyond. (※1)

The global stationary ESS market is expected to grow at a CAGR of 18.0% between 2023 and 2032, and the global market in 2032 is expected to grow to 764,777MWh (* 3) which is 4 times larger than the capacity shipped by manufacturers in 2023. (※1)

※3) :764,777MWh is equivalent to the storage capacity of approximately 80 hours of 9,370 MW of nuclear power plants currently operating in Japan.

矢野経済研究所公開「定置用蓄電池(ESS)世界出荷容量予測」



※1出典:株式会社矢野経済研究所「定置用蓄電池(ESS)世界市場に関する調査(2024年)」(2024年4月1日発表)

※注1. メーカー出荷容量(MWh)ベース 注2. 2023年見込値、2024年以降は予測値

注3. 電力系統関連、家庭用、携帯電話基地局・UPS用、企業・業務用の定置用蓄電池(ESS)を対象とした。

■ Redox Flow Batteries in ESS market

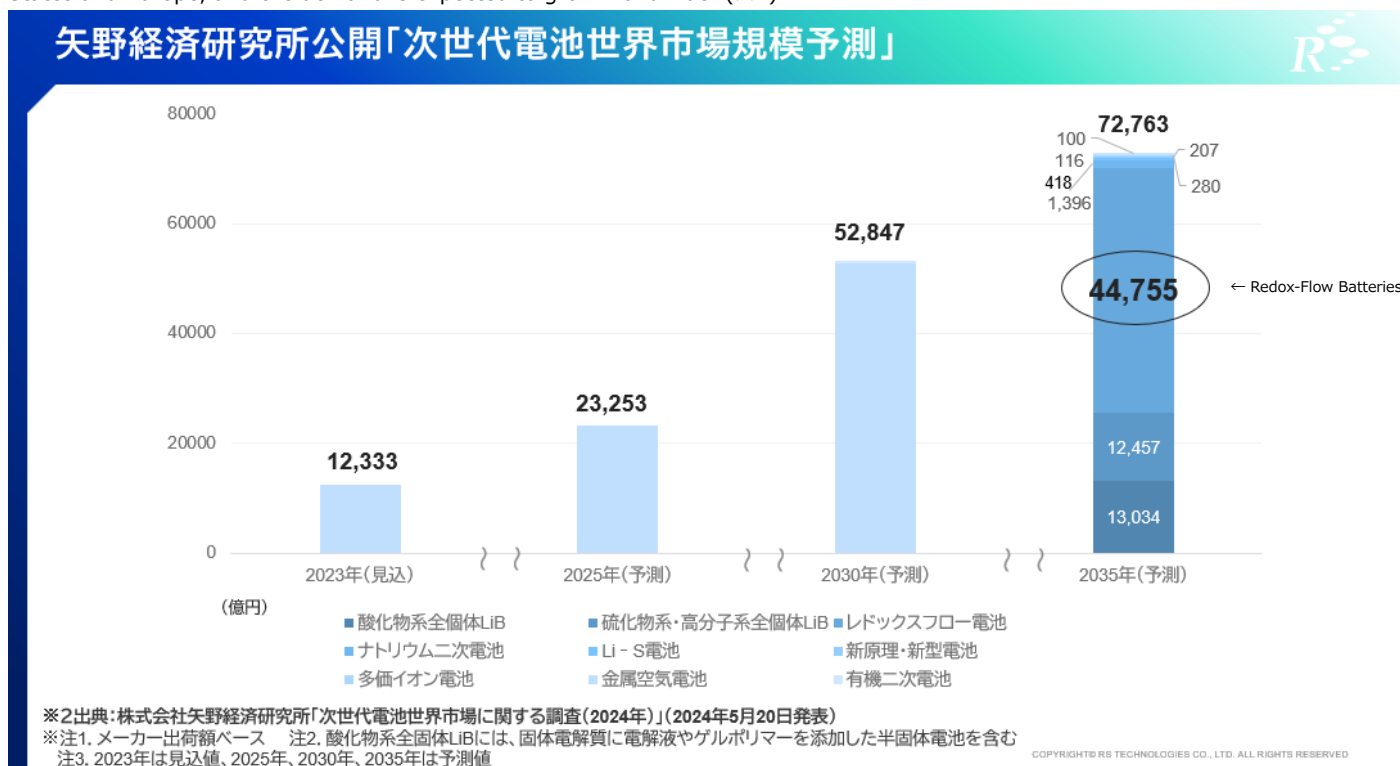
Redox flow batteries are expected to gain a certain share in the ESS market. Redox flow batteries are battery cells that charge and discharge by circulating an electrolytic solution (Redox). Because they can be charged and discharged over a long period of time, they are considered the most suitable for large-scale, large-capacity ESS such as wind power generation and solar power generation.

Therefore, in the future, the market between redox flow batteries and lithium ion batteries which are miniaturized and portable are expected to be divided .

According to a study on the global market for next-generation batteries (2024) released by Yano Research Institute., Ltd. on May 20, 2024, the global market for redox flow batteries is expected to exceed 4.4 trillion yen by 2035.

Large-scale redox-flow batteries are expected to account for a large share of the market in the future, due to an increase in demand for stationary storage batteries for power systems accompanying the spread of renewable energy sources such as solar and wind power.

According to the survey, projects which require redox-flow batteries are rapidly expanding overseas, particularly in the United States and Europe, and the demand is expected to grow worldwide. (※2)



■ Strengths of Vanadium Redox-Flow Batteries

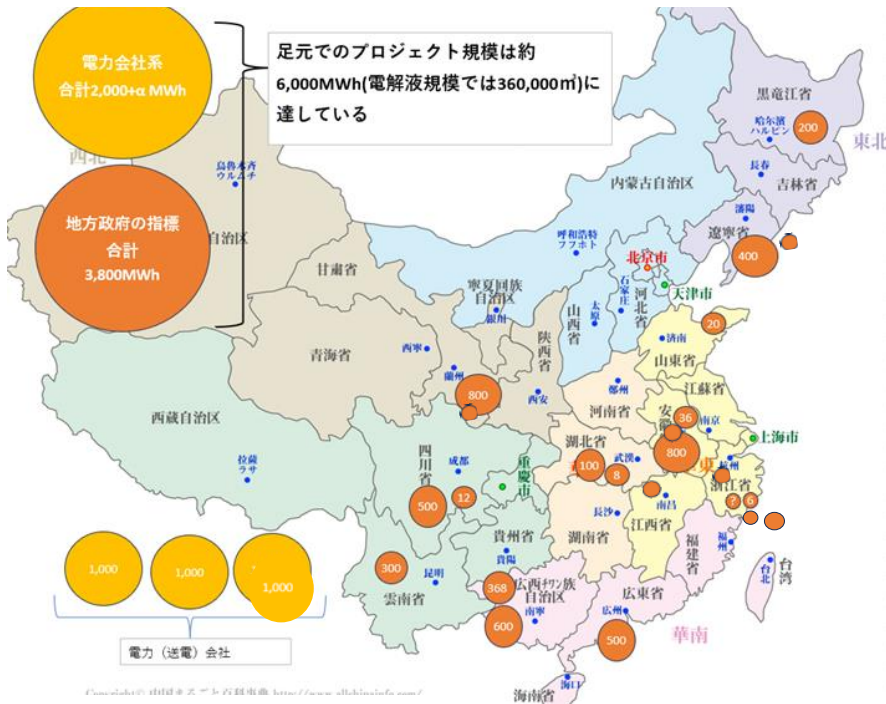
Due to the growing demand for ESSs and redox flow batteries, various studies have been conducted. Among current redox flow batteries, vanadium redox flow batteries using vanadium have the highest stability and are being commercialized in large numbers.

Demand for vanadium redox flow batteries is increasing for large-scale, high-capacity ESSs such as wind and solar power generation because it has a feature of high safety including nonflammability or non-toxicity and more than six hours of charging and discharging.

Although vanadium is a rare metal, it is more ubiquitous than gold, platinum, etc., and is a lower-cost material than electrolytes using noble metals. In addition, due to its large ionization tendency and four valence states (V²⁺, V³⁺, VO²⁺, VO²⁺), various research and demonstration regards vanadium as the most suitable material for electrolytes. At present, it can be said that vanadium is the most suitable material for stable supply and operation.

Furthermore, vanadium's non-degraded characteristics and long life cycle (vanadium redox flow electrolytes can be recycled semi-permanently) draws attention because it leads to long term cost reduction.

In recent years, driven by government's economic policy, ESS projects related to vanadium redox flow batteries have been announced one after another in China



(Based on LE system survey from various documents)

In fact, several Chinese companies get into vanadium and other redox flow batteries and electrolytes business, however, the advantages that LE system have accumulated so far will not be easily lost.

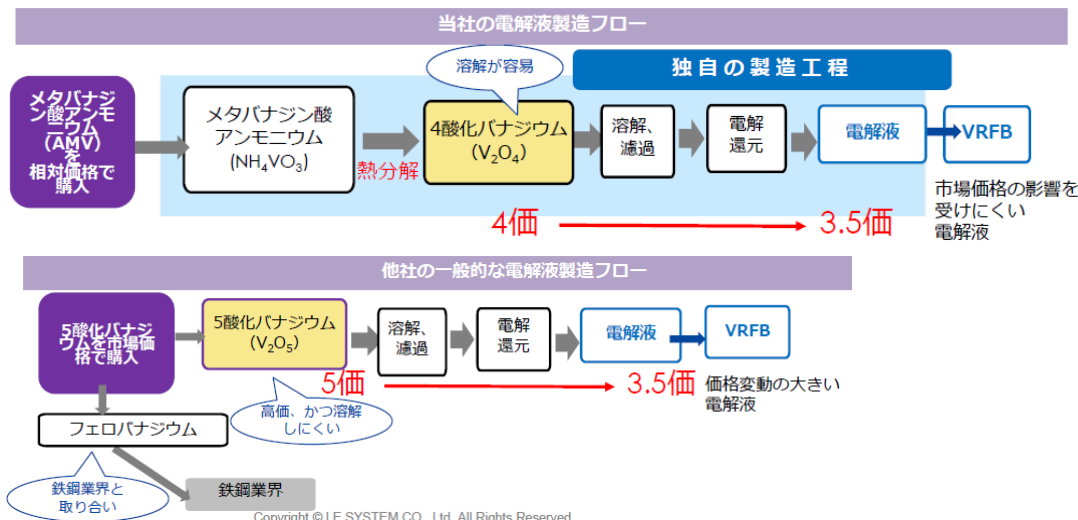
■ Our Advantages (1) Quality

LE system have an efficient manufacturing technology based on our unique "4 valent process" that we have been researching and developing for more than 20 years. This process makes it possible to efficiently manufacture high quality vanadium redox flow electrolytes with high stability in both cost and time.

One of the characteristics of our 4 valent process is that the electrolyte is manufactured from ammonium metavanadate. This process has four advantages over the conventional method of producing electrolytes from vanadium pentoxide.

*Ammonium metavanadate is a raw material at several stages prior to the production of vanadium pentoxide.

- 1) Procurement is conducted through bilateral negotiations, which may result in lower procurement costs
- 2) Dissolution time is about 1/5 shorter than the one for conventional method (shorter production period)
- 3) Electricity cost at the time of production is about 1/2 lower than conventional method
- 4) Impurities are easily removed, and electrolyte with high purity and stability can be produced



■Our Advantages (2) Global Network

Taking advantage of the global sales channels of the RS Technologies Group's semiconductor business, LE system is able to supply vanadium redox flow electrolyte globally, mainly in China and North America, where demand is high.

Since LE system manufactures and sells electrolyte, LE system has collaborated with cell manufacturers in Japan, China, and Europe from the research stage. When LE system receives inquiries from power generation and storage companies, which are our end users, we introduce multiple cell manufacturers in each country, and conversely, cell manufacturers introduce us to end user, depending on the project.

Considering these advantages, RS Technologies aims to supply high-quality electrolytes worldwide and become a leading company in vanadium redox flow electrolytes.

【RS Technologies】

Since the 1970s, LE Systems has focused on "redox flow battery " technology suitable for large-capacity storage systems, and has been engaged in the research and development of " vanadium redox flow battery " that uses vanadium in the electrolyte. The company has received substantial financial support, including investment from INCJ (a public-private investment fund), and holds its own technology and many patents. In December 2023, the company succeeded the business to RS Technologies and became a consolidated subsidiary of RS Technologies. LE system will expand the production capacity and globally sell vanadium redox flow electrolyte to become a leading company in the market.



Company Name: RS Technologies Co., Ltd

Representative: Nagayoshi Ho

Establishment: December 10, 2010

Address: NT Bldg, F17, 1-47-1, Ohi, Shinagawa-ku, Tokyo, JAPAN

Official Website: <https://www.rs-tec.jp/>

【RS Technologies】

RS Technologies is a global company with corporate philosophy, "Respect the global environment, earn the trust of people, and be creative and challenge ourselves". The company was established in 2010 after taking over reclaimed wafer business through M & A. Now, RS Technologies is the world's No. 1 market share in the silicon wafer reclaim business for semiconductors. In 2018, RS Technologies established a joint venture with a China's state-owned Nonferrous Metals Research Institute, turning to become a comprehensive wafer manufacturer. In 2023, RS Technologies entered into the renewable energy business through M & A (business revitalization). By supplying high-quality VRFB electrolytes through its own research and development, RS Technologies aims to create a safe and secure clean energy society.



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