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TRENDS IN THE ECONOMICS OF ENERGY STORAGE

Тренды в экономике хранения энергии

Every year, the problem of climate change becomes more and more serious, and the cost of eliminating it can lead to a reduction of several percent of the world's gross domestic product. Therefore, new environmentally friendly production and rational use of energy are needed to sustain the economy. Thus, renewable energy sources and their storage are becoming more and more popular. The purpose of this article is to trace the trend of development of modern energy storage devices that allow to store the produced energy in the most efficient way.

The greatest growth rate is in the development of batteries and capacitors. Batteries are chemical power sources and can hold electricity for longer, but capacitors, which store energy in the form of charges, are able to release the stored energy more efficiently, that is, at a faster rate. As we know, lithium-ion batteries are still the market leader in the energy storage market. But they have a number of drawbacks, including high fire and temperature sensitivity, self-discharge capability, and susceptibility to aging. Nevertheless, lithium-cobalt batteries are the most in demand. They have been tried many times: it has been proposed to use a new electrode and silicon cathode, which would increase the thermal range, but in practice, the performance varies from copy to copy; lithium-metal batteries, which are more energy-consuming than lithium-ion batteries, have been developed, but the main issue in their use remains safety; it has also been proposed to use sulfur-magnesium batteries, but it turned out that after a certain number of cycles, the efficiency of their use drops by half. Thus, the main problem in creating new energy storage technologies is that when one parameter is improved, the others deteriorate.

According to the report of the international institute "Cobalt Institute" cobalt in 2022 global demand increased by 13% and reached 187 thousand tons. The largest consumer of cobalt for the creation of batteries remains the electric vehicle industry, which is almost 40% of total demand. It is predicted that by the end of the decade, the electric vehicle sector will be responsible for 89% of demand, while other energy storage devices will account for 3%. Thus, the search for new batteries alternative to lithium-cobalt batteries is one of the most promising sectors in the economy.

One of the promising energy storage devices is a graphene battery. Its advantages are large capacity, high conductivity, low weight and a very fast charging

cycle, which can range from a few seconds to a couple of minutes. The main advantage for the economy in using graphene energy batteries is that it is possible to produce graphene on an industrial scale in a cheap way.

Today, there is also a trend in the world to incorporate biological foundations into solutions to global problems. Scientists suggested using high molecular weight compounds as an alternative way to store electricity. The researchers have developed an artificial metabolic pathway that uses electricity to produce adenosine triphosphate (ATP), a high-energy biomolecule that can then be used to form energy-rich chemical compounds. The metabolic pathway was named "AAA Cycle". It contains a minimal set of enzymes and does not require membrane charge separation. This is a completely new technology that radically changes the very understanding of energy storage, and it is too early to say whether it can be widely used.

To summarize, the main trend in the economy of this industry is modernization and search for new methods. Despite the fact that there is only one undisputed leader, there are many cool modern projects being prepared to replace it. Time will tell what the batteries of the future will be like. But the development of this industry will not stop, because energy is life, so the preservation of clean energy is the key to the successful development of the human race.

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INTERNAL FACTORS OF LOW PATENT ACTIVITY

Внутренние факторы низкой патентной активности

Despite the increasing importance of patent activity in the modern world economy, currently there still is a specific problem of low interest in patenting on the part of inventors and companies. Theoretical sources traditionally refer to high financial costs of patenting and low popularization of information about the necessity of this procedure as the main problems of lack of interest in patent protection of created technologies. However, this unfavorable circumstance can also be caused by other factors.

The purpose of this study is to determine the social causes of low patent activity and to identify possible ways to minimize it.

Some of the previously mentioned reasons include: