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WHY ARE PEOPLE EAGER TO LEARN HOW TO STORE ELECTRICITY AND WILL IT EVER BE POSSIBLE?

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Анотація:

У статті розглядаються новітні технології в галузі електроенергетики, завдяки яким розкриваються подальші можливості накопичення електроенергії та чому ця проблема стає ще більш актуальною на сьогодення.

Ключові слова: гнучкість, стійкість, розподілені системи зберігання енергії, регулювання зберігання енергії, потужність.

Abstract:

The article examines the latest technologies in the field of electricity, thanks to which further opportunities for storing electricity are revealed and that is why this problem is becoming even more relevant today.

Keywords: flexibility, sustainability, distributed energy storage systems, energy storage regulation, capacity.

Introduction

The life of a modern person cannot be imagined without electricity. In the era when electricity had not yet been discovered, a person was extremely limited in his capabilities. A huge number of ideas and inventions could not be realized due to the lack of electricity at that time. The discovery in the field of electricity caused a real revolution in the existence and worldview of all mankind. Thanks to this, human civilization was able to develop rapidly, to reach new heights in science and technology. A person was able to make his life much more comfortable, convenient, efficient and joyful. Due to the fact that the importance of electricity in all spheres of life of modern society is enormous, the problems of stable and high-quality energy supply; reliable and sustainable transmission of electricity from power plants to consumers; are extremely important and relevant at the present time. Therefore, the question arises whether it is possible to achieve the accumulation of electricity for its further use.

Storage Technologies Today

Energy is the basis for the development and growth of businesses around the world, and its storage is becoming a key aspect in achieving a sustainable energy balance.

This market is quite new to the world. Such countries as China, the United States of America and members of the European Union have only just begun to actively and rapidly grow in this direction.

This is confirmed by the fact that in 2023 almost as much energy storage capacity was added as in all previous years. Namely – 42 GW. Currently, the total capacity of such systems worldwide is 85 GW. And, according to forecasts, these figures will only grow.

Ukraine is still slightly behind in the field of energy storage. Although this market is starting to develop in our country as well. In particular, in 2023, the transmission system operator NPC Ukrenergo issued a record of 11 technical specifications for the construction of industrial energy storage systems. Therefore, there is every chance that, by adopting the experience of other countries, Ukraine will quickly catch up with them in this area.

Storage technologies will be able to replace or complement almost all other elements of the energy system, including generation, transmission and demand response, these tools will be of crucial importance for designers, operators and regulators of electric power systems in the future.

Problems of Electricity Storage

The accumulation of electricity is a very relevant issue for the current situation in Ukraine. As a result of the war with the aggressor country, more than half of the energy system in our state was destroyed. Therefore, the question of ensuring the accumulated electricity is increasingly arising. But there are certain problems that we will now consider.

NPC Ukrenergo commented on the situation in Ukraine: "In the summer, the power system will need to activate all reserves to provide consumers with electricity while the power plants are being repaired after Russian shelling and exhausting work at maximum. We are often asked: is it not possible to accumulate electricity now so that after some time it can be used as the main reserve to cover a possible deficit?"

Unfortunately, this is impossible. Here is why:

1. *The most modern technologies do not allow storing energy for more than two weeks.*
   Denmark will begin the construction of an energy storage system this year that will allow it to "preserve" electricity from wind farms as heat – in molten salt at a temperature of 700 degrees. Such storage is considered long-term – but in practice it is a maximum of two weeks.
2. *The largest "battery" in the world at maximum capacity can replace only two blocks of our thermal power plants.*
   The largest operating electricity storage system in the world (USA) today has a capacity of 400 MW, which is equal to two blocks of our thermal power plants (TPPs). Its capacity - 1600 MWh - allows you to provide electricity to 300 thousand homes for 4 hours. According to the Ministry of Energy, due to Russian attacks in Ukraine from October to March, 19 blocks of TPPs alone were fired on, many of them several times. Hydroelectric power plants and thermal power plants also suffered serious damage.

3. *Building a large storage system requires billions of dollars in investment.*
   The Western Australian government has earmarked funding for two energy storage projects in its July 2023-June 2024 budget, with a capacity of 500 MW and 200 MW. A year of work will cost the Australian state more than $1.8 billion – and that's just a fraction of the money being invested in the projects.
4. *Powerful storage systems have been under construction for more than a year.*
   The construction of the already mentioned largest storage system in the world began back in 2018. Only in 2020, the company that owns the system put the first stage of the project with a capacity of 300 MW into operation. The second stage with a capacity of 100 MW was put into operation in 2021. Currently, construction of the third stage continues, which will increase the total capacity of the system to 750 MW, capacity - up to 3 thousand MWh. The third stage should be operational in the summer of this year.
5. *Storage systems lose energy when temperatures drop sharply.*
   When an ice storm in December 2022 in Tennessee dropped temperatures below 0 degrees for the first time in 26 years, the Tennessee Valley Authority's "batteries" lost 20% of their power. This left the company unable to provide a stable power supply to its customers as demand for electricity increased: it was 17% short of capacity.

In Ukraine, only one electricity storage system with a capacity of only 1 MW and a capacity of 2.25 MWh has been certified to date. Several more projects are under construction, but it is difficult to predict when they will be put into operation under current conditions.

Conclusion

So, today, new research in the field of electricity storage continues. We know that to create a storage device requires large dimensions, so scientists are trying to achieve this goal by various methods.

Therefore, the only way out today is to save electricity.

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