

GRAVITATIONAL ACCUMULATOR

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Engineers are trying to answer one of the most pressing questions related to our renewable energy – how to store it? The electricity generated by wind and solar farms is not available when the sun isn't shining or the wind isn't blowing, so with no way to store energy, anything that isn't used immediately is wasted [1].

Gravitational accumulators are an innovative energy storage technology based on the use of gravitational potential energy. This technology offers an efficient and environmentally friendly way to store energy that can have a significant impact on the development of renewable energy sources. The principle of operation of gravitational accumulators is based on the lifting or lowering of large masses using electromechanical devices. When energy is available, the mass is raised, converting it into potential energy. When energy is needed, the mass is lowered, converting potential energy back into electrical one. This means that we can store the energy produced by solar panels and wind turbines, and then release this electricity into the grid in the evening, when the load increases due to increased electricity consumption by people returning home from work. The main advantages of gravitational accumulators include high efficiency, long service life, absence of harmful emissions into the environment, and relatively low operating costs. This technology can be used for storing energy from solar and wind installations, as well as for balancing load in power grids.

According to the creators of the system, its efficiency is 75%. That is, the battery returns about 75% of the accumulated kinetic energy. Of course, it is desirable to increase this figure, but for this kind of storage, 75% is an excellent result. The advantage of the system is that it is simple, reliable, assembled from local components, including blocks, and can work in any climatic conditions without special control and sophisticated climate equipment [1].

The approximate cost of a gravitational accumulator can vary depending on its power, size, and technical specifications. Typically, the price of such devices can range from hundreds of thousands to several million dollars. According to known projects, one of the largest gravitational accumulators in the world is the Energy Vault project in Switzerland. Energy Vault built its first prototype in 2018, and its technology is based on using heavy blocks for energy storage. The accumulator consists of towers in which blocks are raised and lowered, converting mechanical energy into electrical one. Such projects demonstrate the potential of gravitational accumulators in energy storage and their importance for the development of sustainable and efficient energy supply systems.

Countries around the world are increasingly focusing on gravitational accumulator projects due to their efficiency and potential for sustainable energy storage. Some of the countries where gravitational accumulators have been built or planned include:

1. Energy Vault – a major gravitational accumulator project that was developed in Switzerland and has gained international attention for its innovative technology;

2. Italy is also performing research and projects on gravitational accumulators as part of its strategy for developing renewable energy sources;

3. China is actively developing its energy sector and adopting new technologies, including gravity batteries, into its energy infrastructure;

4. The United States of America are carrying out research and pilot projects on the use of gravitational accumulators to enhance the reliability and efficiency of energy systems.

Gravitational accumulators represent a promising direction in the field of energy and can become an important element in creating a sustainable and efficient energy supply system.

Thanks to their reliability, cost-effectiveness, and environmental safety, this technology has the potential to become a key component of future energy systems.

References

1. How Gravity Batteries will help us Switch to Renewable Energy [Electronic resource] – Mode of access: <https://www.weforum.org/agenda/2022/07/gravity-batteries-store-renewable-energy/>. – Date of access: 13.03.2024.