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THE FORGOTTEN ROLE OF GRAVITATION AS A SOURCE OF ENERGY STORAGE. BEST INTERNATIONAL PRACTICES IN SMALL- AND LARGE-SCALE APPLICATIONS

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Introduction. Nowadays, the world is increasingly considered on renewable energy revolution. Despite all positive effects, there is a riddle at the heart of the renewable energy sources. The question is in conditions, when there is no sun and wind, then there is no energy…

Last a long-time researchers begun to think around the application of the boundless drive, which surrounds all of us: gravity. Underpinned by Newton's immutable logic – what goes up, must come down – this new field of energy storage technology is, in principle, remarkably simple. When green energy is plentiful, use it to haul a colossal weight to a predetermined height. When renewables are limited, release the load, powering a generator with the downward gravitational pull. Therefore, our task is to find safe, and long-life energy storage to ensure stable supply. All these requirements meet gravitational potential energy. Using the comparative method, it is possible to analyse the most effective current technologies.

The main part. This research will focus on the evaluation of energy storage solutions such as batteries. Starting with a description of currently available energy storage systems and progressing through a brief history of gravitational force usage supported by terms, further research will focus on the application of small- and large-scale gravitational storage systems, culminating with a comparison of the described different technologies and their efficiency.

There are several types of energy storage devices available, such as lead acid or lithium-ion batteries. However, they are not perfect from an ecological standpoint, since they have issues with disposal, efficiency, and charging time. Although we have many renewable energy sources, such as solar, wind, and tidal, there are still certain restrictions to their use. Resources are free; however they cannot be used in all circumstances and are not storable. To solve all these issues, there is a gravity battery. It can store electrical energy in the form of potential energy, which can then be transformed back into kinetic energy and used to power a generator to create electrical energy when needed.

The study subject aims to take the energy conservation system to a new level by utilizing accessible technologies such as gravity systems. Let us begin our investigation of the subject with history. In early 1656 the pendulum clock was invented by Christiaan Huygens. That was the earliest device, which is used gravity to power mechanical movement. The clock was powered by the force of gravity using an escapement mechanism, that made a pendulum move back and forth. Since then, gravity batteries have advanced into systems that can use the power of gravity and turn it into electricity for large scale energy storage. The first gravity based pumped-storage hydroelectricity (PSH) system was developed in 1907 in Switzerland. As of 2019, the total world capacity for PSH is 168 GW [1]. By summarizing the abovementioned, it possible to identify the primary issue with present renewable energy sources. This is how the problem can be stated. Green energy has found applications in a variety of fields and has enhanced its competitive position in comparison to traditional fossil fuels. On the other hand, it is required to create circumstances and carefully pick the geographical location of future installations for them to be effective. The issue is that such energy sources are volatile and difficult to store for days without the proper meteorological conditions. Gravity energy storage systems chosen as a scope for precise study in this paper [2].

Results. GESS outperforms other systems in terms of LCA analysis since it is regarded a more ecologically friendly option with less site-specific technology. If such benefits are reflected in the evaluation, this will almost certainly improve the economic performance of this system. Mechanical energy storage, such as GES and GESH, is most affected by changes in the discount rate. This is owing to these systems' technological qualities, which include construction time and longevity. The

discount rate has a little impact on other methods of energy storage, such as batteries. The projected LCOE is heavily influenced by the price of energy. The latter ranges from 0.087 € per kWh to 0.137 € per kWh for 1€ per kWh and 5€ per kWh energy tariffs, respectively [3]. The decision-making tree proposed as a good tool for choosing a particular technology among other gravitational storage systems. The decision tree principle is presented as follows: "feasible decision problem" is defined as a problem that can divide an existing set into two non-empty sets. Although the decision tree is not unique depending on the actual decision problem. Each valid decision problem consists of two branches (Yes and No), one of which is the "dominant branch". A "dominant branch" is one whose elements are suitable for another branch. Further precise questions can be used, such as questions related to the terrain, volume of power, resource availability and security.

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