



GRAVITY BATTERY FOR RENEWABLE ENERGY SOURCES

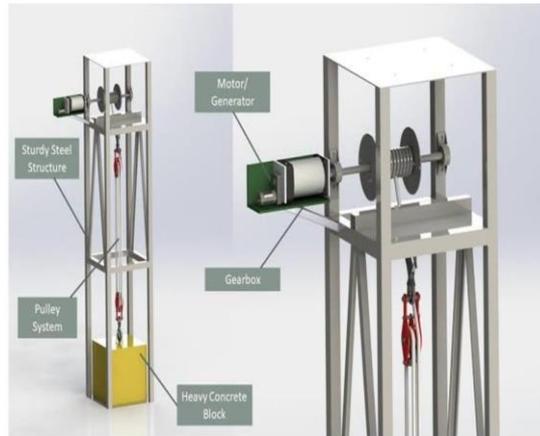
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Abstract : As the world transitions towards a more sustainable future, renewable energy sources such as solar and wind power are gaining significant traction. However, the intermittent nature of these energy sources poses a challenge in maintaining a stable and reliable power supply. Energy storage systems play a crucial role in bridging this gap and ensuring continuous energy availability. reactions, a gravity battery harnesses gravitational potential energy to store and release electricity. This innovative approach offers several advantages, including scalability, cost-effectiveness, and a low Environmental impact. This provides an overview of the gravity battery technology and its potential as an energy storage solution for renewable sources. It discusses the fundamental principle behind the gravity battery, which involves lifting heavy masses to store potential energy and lowering Them to release electricity. It explores different designs and configurations, including the use of water or other fluids as the medium for energy transfer. Furthermore, the abstract highlights the benefits of a gravity battery, such as its ability to store large amounts of energy for extended periods, high round-trip efficiency, and long Lifespan. It also addresses the challenges and considerations associated with implementing gravity battery systems, including site selection, construction requirements, and Maintenance needs. The abstract concludes by emphasizing the significance of gravity batteries in enabling the widespread adoption of renewable energy sources. By providing a reliable and efficient Energy storage

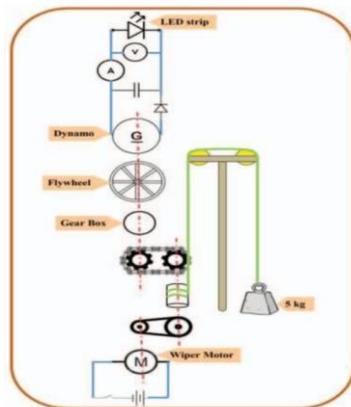
I. INTRODUCTION

The idea sounds simple – when there is plenty of green energy, the batteries use the power to lift a heavy weight either high into the air or to the top of a deep shaft. Then when the power is needed, winches gradually lower the weight, and produce electricity from the Movement of the cables. This would mean you could store power captured by a solar farm during the day when the sun is shining, and then release that electricity to the grid in the evening when demand rises because people are at home using electricity to watch TV, cook and heat their homes. Gravity battery system Gravity's system lifts and then lowers heavy One form of a gravity battery is one that lowers a mass, such as a block of concrete, to Generate electricity. The most common gravity battery is used in pumped-storage Hydroelectricity, where water is pumped to higher elevations to store energy and released through water turbines to generate electricity. Gravity battery is a type of electricity storage device that stores gravitational energy, the energy stored in an object resulting from a change in height due to gravity, also called Potential energy. A gravity battery works by using excess energy (usually from sustainable sources) to raise a mass to generate gravitational potential energy, which is then lowered to convert potential energy into electricity through an electric generator. One form of a gravity battery is one that lowers a mass, such as a block of concrete, to generate electricity. The Most common gravity battery is used in pumped-storage hydroelectricity, where water is pumped to higher elevations to store energy and released through water turbines to Generate electricity. These systems could be installed alongside green power generation to smooth out the variability of renewable energy, as green generation does not always keep pace with the power demand cycle. A gravity battery is a type of electrical storage device that stores gravitational energy, or the stored energy of an object due to a change in height caused by gravity, also called potential energy.



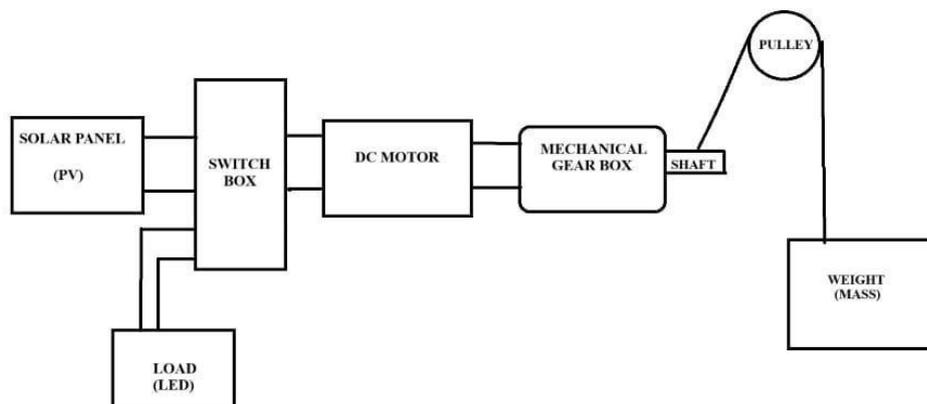
Large-scale energy storage technology is crucial to maintaining a high-proportion renewable energy power system stability and addressing the energy crisis and environmental problems.

Solid gravity energy storage technology (SGES) is a promising mechanical energy storage technology suitable for large-scale applications. However no systematic summary of this technology research and application progress has been seen.



II. BLOCK DIAGRAM

BLOCK DIAGRAM



III. METHODOLOGY

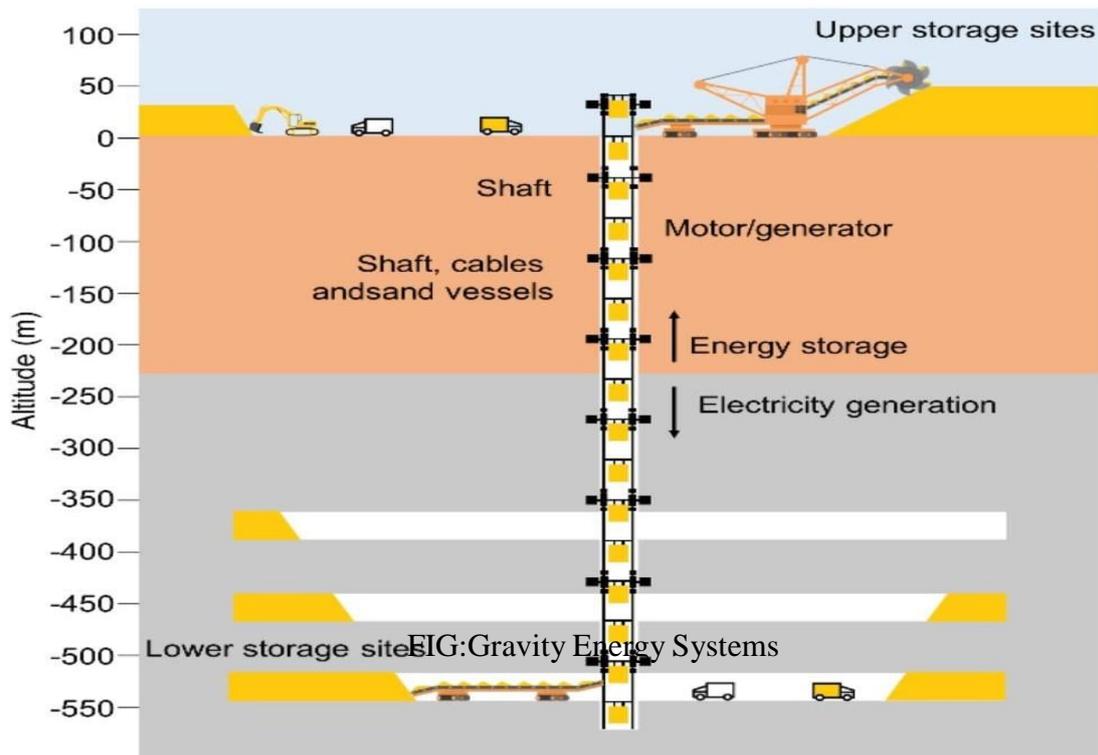
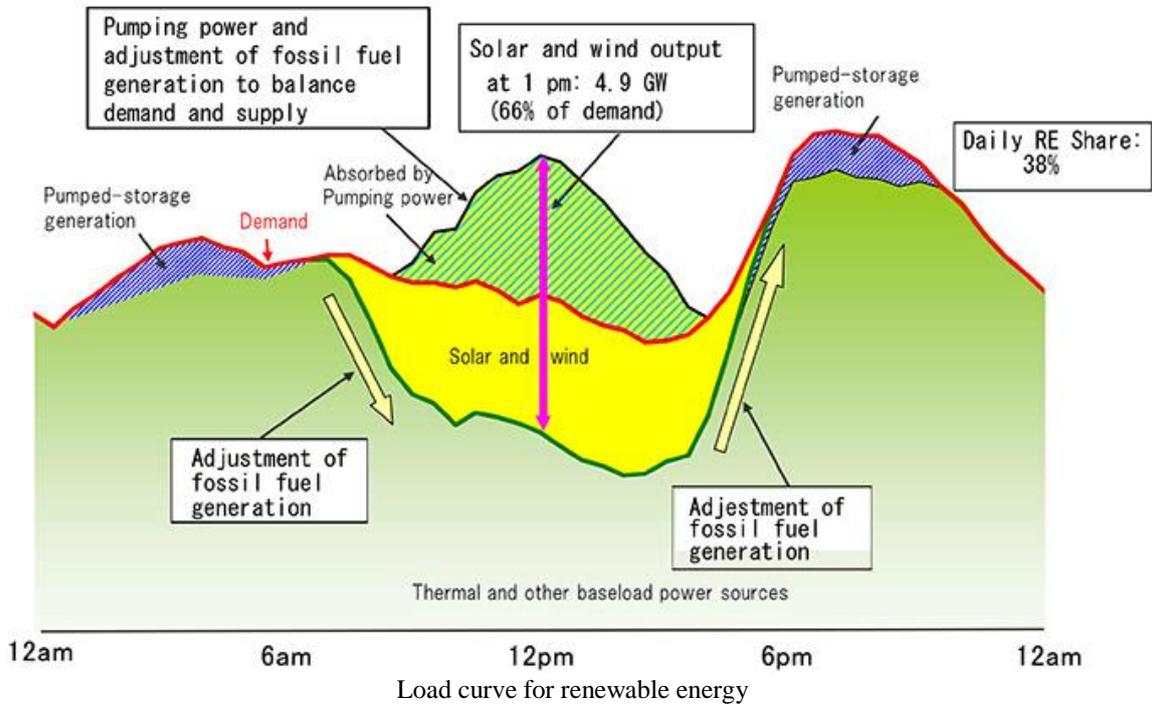
1. The Conceptual design begins with a comprehensive study of gravity battery systems Analysing the existing models and the technologies.
2. The Component Selection does depends on identifying and select the appropriatematerials
3. And components for the prototype ensuring the affordability and sustainability.
4. The prototype construction is to build a small-scale gravity battery model that incorporatesthe key design principles.
5. The energy storage and release testing is to conduct experiments .This is being done toevaluate the Prototype’s ability to store release energy efficiently.
6. The performance optimization is to refine the prototype through iterative testing andadjustments to enhance its energy storage and release capabilities.
7. The environmental impact and sustainability of the prototype’s materials and constructionMethods

Theoretical calculation

Potential Energy (PE)	Power × Time	60 W×300 s=18000 J	18000 J
Weight × Height × Gravity = PE	PE = Weight × Height × Gravity	Weight×Height×9.81=18000J	Solve for Weight or Height
Height (assuming)	Height =PE/(Weight× Gravity) Height =PE/(Weight×9.81)	ITERATIVE	ITERATIVE
Weight (assuming)	Weight =PE/(Height× Gravity) Weight =PE/(Height×9.81)	ITERATIVE	ITERATIVE

IV. FUTURE SCOPE

A number of companies have invested considerably in gravity batteries, and boastimpressive figures regarding energy efficiency and power storage. The first gravity based pumped-storage hydroelectricity (PSH) system was developed in 1907in Switzerland. Pumped-storage hydroelectricity (PSH), or pumped hydroelectric energy storage (PHES), is a type of hydroelectric energy storage used by electric power systems for load balancing. The method stores energy in the form of gravitational potential energy of water, pumped from a lower elevation reservoir to a higher elevation. Low-cost surplus off-peak electric power is typically used to run the pumps. In 1930, pumped-storage came to the United States by the Connecticut Electric and Power Company. As of 2019, the total world capacity for PSH is 168 GW (gigawatts). The United States has 23 GW capacity from PSH, accounting for nearly 2% of the energy supply system and 95% of utility-scale energystorage in the US. Gravity based pumped-storage electricity is currently the largest form ofgrid energy storage in the world.



CONCLUSION

These systems work by lifting heavy objects, such as weights or large volumes of water, to a higher position when excess energy is available. When energy is needed, the objects are lowered, and their potential energy is converted back into electricity. One of the key advantages of gravity batteries is their ability to store large amounts of energy for an extended period. Compared to other energy storage technologies, gravity batteries can be designed with a high energy density, making them suitable for applications that require long-duration storage, such as renewable energy integration and grid stabilization.

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