



Gravity Energy Storage

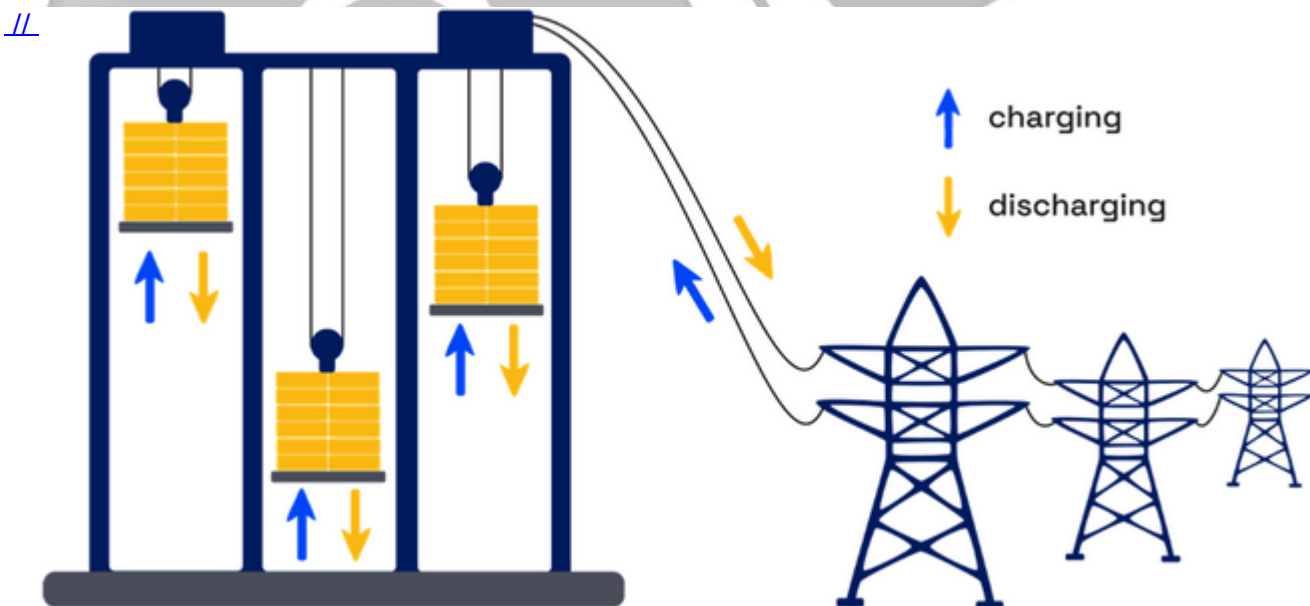
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Why in News?

Gravity Energy Storage is emerging as an **innovative** and **cost-effective solution** to address a key challenge of renewable energy. It is also acting as a promising alternative to traditional [battery energy storage](#).

What is Gravity Energy Storage?

- **Definition:** It is an **innovative technology** designed to store energy by leveraging the force of gravity.
- **Principle of Operation:** The core principle of **Gravity Energy Storage** lies in **potential energy**.
 - It involves **lifting heavy masses** during periods of excess energy generation and releasing them to produce electricity when needed.
- **Energy Conversion:** A turbine or generator converts the descending motion of a piston into electricity.
 - A common design involves a **fluid-filled cylinder** with a heavy piston.
 - During surplus electricity generation, the **piston is lifted**, storing energy.
 - When energy is needed, the **piston descends**, driving water through a turbine to produce power.



- **Environmental Sustainability:** Unlike traditional battery storage, gravity energy systems **avoid chemical-based energy storage**, making them [environmentally sustainable](#) and long-lasting.

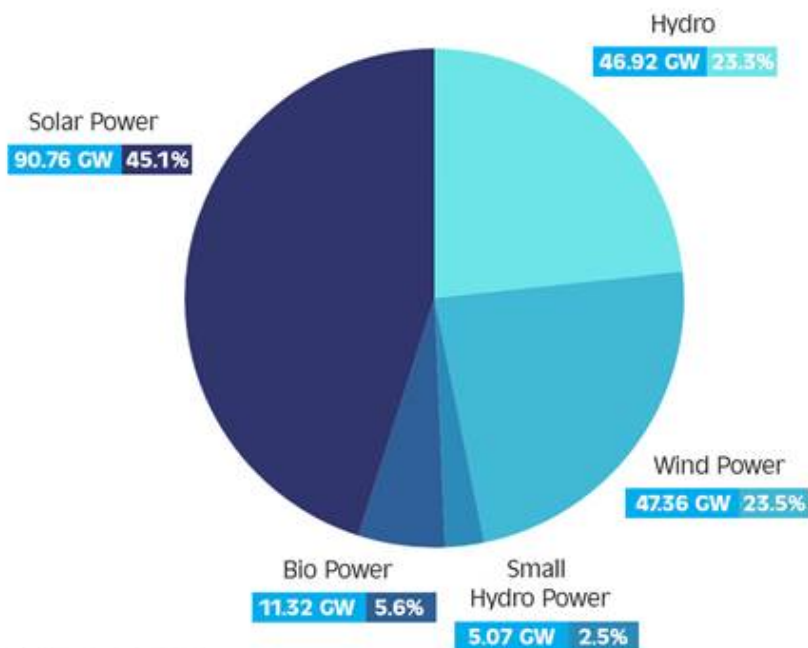
▪ **Advantages:**

- **Site Flexibility:** Unlike **pumped-hydro systems** that require specific geographical features, gravity energy systems can be implemented in diverse locations.
- **Scalability:** Systems can be adapted to different energy capacities, making them ideal for **grid-scale storage**.
- **Longevity:** Minimal mechanical degradation ensures decades of operation with **low maintenance**.

How Can Gravity Energy Storage Address the Challenges of Renewable Energy in India?

- **The Intermittency Issue:** **Solar and wind energy** are not constant, they depend on weather and time of day.
 - With schemes like the **National Solar Mission** and expanding wind power capacities, gravity energy storage can help **stabilize the grid** by addressing intermittency.
 - **Reliable energy storage** is essential to balance supply and demand, especially during peak usage or low production periods.
- **High Energy Capacity:** Can store large amounts of energy, bridging the gap during low renewable production.
- **Low Environmental Impact:** It reduces harmful chemical reactions, minimizing impact and disposal issues, supporting the transition to a greener planet.
- **India's Renewable Energy Push:** India aims to achieve **500 GW of non-fossil fuel capacity by 2030** under its renewable energy initiatives.
 - Gravity energy storage can complement these efforts by providing **reliable and cost-effective storage** for the large-scale solar and wind projects being deployed across the country.

Renewable Energy Capacity in India



As of October 10, 2024

Prelims:

Q. Consider the following statements: (2016)

1. The International Solar Alliance was launched at the United Nations Climate Change Conference in 2015.
2. The Alliance includes all the member countries of the United Nations.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

Ans: (a)

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