

GRAVITY BATTERY: HOW GRAVITY MAY SOLVE GREEN POWER'S PROBLEM

Why in News?

- As countries step up renewable energy capacity addition, there is growing urgency to develop long-duration energy storage systems.
- Gravity batteries are emerging as the best bet in solving renewable energy's biggest problem - intermittency.

What is a Gravity Battery?

- A 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.
 - This is then lowered to convert potential energy into electricity through an electric generator.
- The most common gravity battery is used in **pumped-storage hydroelectricity (PSH)**, where water is pumped to higher elevations to store energy and released through water turbines to generate electricity.
- Another form of a gravity battery **lowers a mass**, such as a block of concrete, to generate electricity.
- **As of 2019, the total world capacity for PSH is 168 GW (gigawatts)**. The US has 23 GW capacity from PSH, accounting for nearly 2% of the energy supply system and 95% of utility-scale energy storage in the US.
- **Gravity based pumped-storage electricity** is currently the largest form of grid energy storage in the world.

Development of Long-duration Energy Storage Systems:

- As countries step up renewable energy capacity addition, there is growing urgency to develop long-duration energy storage systems.

- These systems could be installed alongside green power generation to **balance out the variability in renewable power**, given that green generation is not always in sync with the electricity demand cycle.
- **Energy Vault** (a Swiss company founded in 2017), a developer of utility-scale storage technology, is offering a proprietary gravity-based storage, to plug this gap.
- Energy Vault's proprietary '**EVx**' platform utilises gravity and a mechanical elevator system to stack 35-tonne blocks made of a composite material at the top of a towering structure.
- **When the electricity demand is low**, the elevator uses surplus electricity from the grid or electricity generated by renewable plants, to raise these blocks and line them up at the top of the structure.
- **When electricity demand picks up**, the blocks are then lowered one by one, releasing kinetic energy that is used to rotate a motor and generate electricity, which can then be pumped back to the grid.

Advantages of the 'EVx' Platform:

- This type of energy storage could be **an innovative solution for countries** (including India).
- It can solve the biggest impediments to wider deployment of renewable generation - **the ability for power companies to store energy for use by consumers when the sun is not shining or the wind is not blowing**.
- This could also **facilitate the shift to a circular economy** while ensuring clean energy transition.

Gravity Batteries vs Lithium-ion Batteries:

- Gravity batteries are not the only way renewable energy can be stored, **lithium-ion batteries dominate the market and some experts favour green hydrogen**.
- But **gravity is free, clean and easily accessible**, without the complications of producing hydrogen or the environmental and human rights concerns linked to some lithium mining.
- While lithium-ion batteries lose capacity after they have been charged and recharged over years, **the gravity systems are made of robust components** which will last much longer.

India's Renewable Energy Push and Challenges:

- The country is the **world's third largest producer of renewable energy** and nearly 40% of installed electricity capacity comes from non-fossil fuel sources.
- This green push has resulted in a **24% reduction in emission intensity of GDP** between 2005 and 2016, but it has also thrown up **challenges of a grid being increasingly powered by renewables.**
- Also, grid managers are already grappling with the **challenge of operationally sustaining a massive monthly addition** of an average 1,000 megawatt from renewables to the electricity grid.
- Policy makers are of the view that New Delhi needs to **expeditiously work on developing viable energy storage options.**
- **There are two alternatives** being considered by the government for now: **hydrogen and hybrid generation models** blended with off-stream pumped storage.

Developments in India in the Field of Gravity Battery Storage Systems:

- India's push for deployment of large-scale renewable power makes storage a prerequisite to support this expansion.
- Energy Vault is in the process of establishing a base in **Bengaluru**. It is in talks with NTPC Ltd (India's biggest generation utility), Mumbai-based Tata Power and green energy company ReNew Power for collaborations.
- **NTPC had signed an MoU** last year for a long-term strategic partnership for the deployment of Energy Vault's EVx energy storage technology and software solutions.

J&K ACHIEVES 100% OPEN DEFECATION FREE PLUS MODEL STATUS

All villages within the union territory of Jammu and Kashmir have attained the status of being Open Defecation-Free (ODF) Plus Model as part of the Swachh Bharat Mission.



All 6,650 villages of **Jammu and Kashmir** have been declared **Open Defecation-Free (ODF) Plus Model** under the Swachh Bharat Mission. Under the visionary leadership of Prime Minister Narendra Modi, Jammu and Kashmir has achieved a

status that extends beyond constructing toilets; it encompasses the management of **greywater** and **solid waste** in each village.

The Journey to ODF Plus Model

Achieving ODF Plus Model status is not an overnight endeavor but a journey that involves three stages: **Aspiring**, **Rising**, and **Model**. Villages progress through these stages by meeting specific criteria.

When a village demonstrates **visual cleanliness** with minimal litter, stagnant water, effective solid and liquid waste management, and sufficient information, education, and communication (IEC) activities, it is declared as an ODF Plus Model.

The Role of Coordination

The achievement of this milestone was made possible through coordinated efforts. The rural sanitation department developed a comprehensive plan that involved all stakeholders before its execution. **Village Sanitation Saturation Plans (VSSP)** were created for each village to ensure that the necessary infrastructure and resources for solid and liquid waste management were available.

Greywater Management

Greywater management, which involves the **proper handling of water** generated from activities like cooking and bathing, received special attention. Departments at both the household and community levels developed soak pits, magic pits, and leach pits to manage greywater effectively.

Additionally, residents were encouraged to segregate waste and process wet waste in compost pits. The construction of **1,850 waste collection and segregation sheds** further ensured proper waste disposal. Furthermore, 536 community sanitary complexes were constructed across Jammu and Kashmir, contributing to improved sanitation.

Plastic Waste Management

A critical aspect of the ODF Plus Model initiative is the management of plastic waste. **Plastic Waste Management Units (PWMUs)** were established in each block, with some nearing

completion. These units will clean, shred, and bail plastic waste for proper disposal. The entire life cycle of waste, from collection to disposal, is being meticulously managed.

Innovative Campaigns and Initiatives

Throughout Phase 2 of the Swachh Bharat Mission (Grameen) campaign, Jammu and Kashmir have undertaken numerous innovative campaigns and initiatives to promote cleanliness and sanitation.

These include the introduction of **Pink Toilets** to improve school attendance, implementing a zero-landfill policy during the Amarnath Yatra, launching the ‘**Give Polythene Get Gold**’ campaign, promoting ‘pink societies’ for holistic development, conducting Sarpanch Samvads, offering Swachhata internships, organizing Swachhata quizzes, and hosting the **Swachh Yodha Pratiyogita**.

A Beacon of Dedication, Collaboration, and Innovation for a Cleaner India

This achievement reflects the dedication of the government, the tireless efforts of various departments, and the active participation of citizens in maintaining cleanliness and sanitation. As the union territory continues to focus on sustainable waste management and innovative campaigns, it sets an inspiring example for the rest of the country in its quest for a cleaner and healthier India.

GOOGLE DOODLE CELEBRATES APPALACHIAN TRAIL, WORLD’S LONGEST HIKING-ONLY FOOTPATH



Google Doodle celebrates the Appalachian Trail, the world's longest hiking path, on October 2nd, encouraging you to reconnect with nature and embark on a unique adventure.

On October 2nd, **Google Doodle** pays tribute to the **Appalachian Trail**, the longest hiking-only footpath in the world. This iconic trail has captivated the hearts of adventurers, nature enthusiasts, and explorers for nearly a century.



CROSS & CLIMB ROHTAK



The National Trails System Act and the Birth of a Scenic Trail

Back in **1968**, a pivotal moment in the history of American wilderness preservation occurred. **The National Trails System Act** was signed into law by former President Lyndon B. Johnson. This landmark legislation not only recognized the importance of preserving natural landscapes but also designated the Appalachian Trail as **one of the country's first National Scenic Trails**.

This declaration bestowed federal protection on the trail, acknowledging it as a piece of America's natural heritage. Since then, the Appalachian Trail has become a symbol of adventure, solitude, and the unspoiled beauty of the great outdoors.

The Appalachian Trail: A 2,190-Mile Odyssey

The Appalachian Trail is an awe-inspiring **2,193-mile footpath** that traverses 14 U.S. states. It winds its way along the crests and valleys of the **Appalachian Mountain Range**, taking hikers on a captivating journey. The trail's southern terminus begins at Springer Mountain, Georgia, and stretches all the way north to its grand finale at Katahdin, Maine.

The Visionary Behind the Trail: Benton MacKaye

The origins of the Appalachian Trail can be traced back to the visionary **Benton MacKaye**, a forester, conservationist, and lifelong outdoorsman. In 1921, he proposed the idea of the trail in his plan titled "**An Appalachian Trail: A Project in Regional Planning**." MacKaye's initial vision included a network of self-sustaining agricultural camps along the trail. Over time, like-minded individuals rallied behind his cause, and this burgeoning community eventually became known as the Appalachian Trail Conference.

A Trail Fully Connected: 1937

It wasn't until 1937 that the dream of a fully connected Appalachian Trail was realized, thanks to the combined efforts of many dedicated trailblazers. The trail now spanned from **Springer Mountain** in Georgia to **Mount Katahdin** in Maine, providing a continuous path for adventurers to explore.



CROSS & CLIMB ROHTAK



Key Highlights of the Appalachian Trail

If you're considering embarking on the epic journey of hiking the Appalachian Trail, here are some essential insights:

Length and Duration: Hiking the full trail is no small feat, taking about **five to seven months** to complete. Thorough preparation and supplies are a must for this challenging adventure.

Visitor Statistics: Annually, approximately 3 million people visit the trail, with around 3,000 individuals attempting to hike it end-to-end. This highlights the enduring popularity of the trail among outdoor enthusiasts.

Iconic Spots: According to Google, one of the most photographed spots on the Appalachian Trail is the **viewpoint at McAfee's Knob**. This breathtaking location offers stunning vistas of the surrounding landscape.

Biodiversity: The Appalachian Trail is not just a hiker's paradise; it's also a sanctuary for thousands of plant and animal species, including over 2,000 rare and endangered ones. It serves as a living testament to the importance of preserving our natural heritage.

The Google Doodle celebrating the Appalachian Trail on October 2nd is a reminder of the remarkable journey this trail represents. It's an invitation to explore the beauty of the American wilderness, reconnect with nature, and embark on an adventure of a lifetime. Whether you're an experienced hiker or someone looking for a new challenge, the Appalachian Trail beckons with its grandeur and allure.

[NOBEL PRIZE 2023 IN MEDICINE OR PHYSIOLOGY ANNOUNCED, CHECK ALL THE DETAILS](#)

Katalin Karikó and Drew Weissman “for their discoveries concerning nucleoside base modifications that enabled the development of effective mRNA vaccines against COVID-19”.



Katalin Karikó and Drew Weissman “for their discoveries concerning nucleoside base modifications that enabled the development of effective **mRNA vaccines**

Nobel Prize 2023 In Medicine or Physiology Announced, Check All The Details





CROSS & CLIMB ROHTAK



against COVID-19". The Nobel Assembly at Karolinska Institutet has today decided to award the 2023 Nobel Prize in Physiology or Medicine.

The discoveries by the two Nobel Laureates were critical for developing effective mRNA vaccines against COVID-19 during the pandemic that began in early 2020. Through their groundbreaking findings, which have fundamentally changed our understanding of how mRNA interacts with our immune system, the laureates contributed to the unprecedented rate of vaccine development during one of the greatest threats to human health in modern times.

mRNA vaccines: A promising idea

In our cells, genetic information encoded in DNA is transferred to messenger RNA (mRNA), which is used as a template for protein production. During the 1980s, efficient methods for producing mRNA without cell culture were introduced, called in vitro transcription. This decisive step accelerated the development of molecular biology applications in several fields. Ideas of using mRNA technologies for vaccine and therapeutic purposes also took off, but roadblocks lay ahead. In vitro transcribed mRNA was considered unstable and challenging to deliver, requiring the development of sophisticated carrier lipid systems to encapsulate the mRNA. Moreover, in vitro-produced mRNA gave rise to inflammatory reactions. Enthusiasm for developing the mRNA technology for clinical purposes was, therefore, initially limited.

About the Katalin Karikó and Drew Weissman

Katalin Karikó was born in **1955 in Szolnok, Hungary**. She received her PhD from Szeged's University in 1982 and performed postdoctoral research at the Hungarian Academy of Sciences in Szeged until 1985. She then conducted postdoctoral research at Temple University, Philadelphia, and the University of Health Science, Bethesda. In 1989, she was appointed Assistant Professor at the University of Pennsylvania, where she remained until 2013. After that, she became vice president and later senior vice president at BioNTech RNA Pharmaceuticals. Since 2021, she has been a Professor at Szeged University and an Adjunct Professor at Perelman School of Medicine at the University of Pennsylvania.

Drew Weissman was born in **1959 in Lexington, Massachusetts, USA**. He received his MD, PhD degrees from Boston University in 1987. He did his clinical training at Beth Israel





CROSS & CLIMB ROHTAK



Deaconess Medical Center at Harvard Medical School and postdoctoral research at the National Institutes of Health. In 1997, Weissman established his research group at the Perelman School of Medicine at the University of Pennsylvania. He is the Roberts Family Professor in Vaccine Research and Director of the Penn Institute for RNA Innovations.

Important Facts on the Nobel Prize in Physiology or Medicine

On 27 November 1895, Alfred Nobel signed his last will and testament, giving the largest share of his fortune to a series of prizes, the Nobel Prizes. As described in Nobel's will, one part was dedicated to "the person who shall have made the most important discovery within the domain of physiology or medicine". Learn more about the Nobel Prize in Physiology or Medicine from 1901 to 2022.

Number of Nobel Prizes in Physiology or Medicine

113 Nobel Prizes in Physiology or Medicine have been awarded since 1901. It was not awarded on nine occasions: in 1915, 1916, 1917, 1918, 1921, 1925, 1940, 1941 and 1942.

Number of Nobel Prize laureates in physiology or medicine

225 individuals have been awarded 1901-2022.

Youngest medicine laureate

To date, the youngest Nobel Prize laureate in physiology or medicine is **Frederick G. Banting**, who was 32 years old when he was awarded the medicine prize in 1923.

Oldest medicine laureate

The oldest Nobel Prize laureate in physiology or medicine to date is **Peyton Rous**, who was 87 years old when he was awarded the medicine prize in 1966.