**Abandoned mines** can be repurposed as clean energy storage systems, allowing for the efficient and cost-effective storage of renewable energy. The reinvention of the energy system based on innovative solutions that utilize resources effectively is necessary for decarbonizing the economy. Using old abandoned mines for storing energy is one of the many alternatives.

International scientists have invented a revolutionary energy storage method by transferring sand into abandoned subterranean mines. **Underground Gravity Energy Storage** (UGES) is a revolutionary approach that promises an efficient long-term energy storage method while maximizing the use of abandoned mining sites.

**What is Underground Gravity Energy Storage (UGES)?**

Underground Gravity Energy Storage (UGES) is a novel concept that involves using abandoned underground mines to store energy by transporting sand into them. The idea is that during periods of excess energy production, sand would be pumped into the mines using that excess energy. The weight of the sand would then be used to generate electricity when energy is needed.

UGES is based on using gravity to store energy, similar to how pumped hydroelectric storage uses gravity to generate electricity. However, UGES uses existing infrastructure, such as abandoned mines, which reduces the cost and environmental impact of building new energy storage facilities.

**Working Process of Underground Gravity Energy Storage**

UGES produces electricity by descending sand into an abandoned mine, using the potential energy by regenerative braking, and then elevating the sand from the mine to a higher reservoir utilizing electric motors to store energy.

UGES consists of two stages. A conveyor system would transport sand into the mine during the charging stage. During the discharging stage, the sand would be released to fall back to the surface. The falling sand would drive a turbine that generates electricity. The sand is captured at the bottom of the mine and transported back to the surface to be used again in the charging stage.

Based on this approach, the primary components of UGES consist of a vertical shaft, a motor/generator, higher and lower storage facilities, and mining equipment. Large amounts of sand are raised and dumped using the shafts and electric motors/generators.

The deeper and wider the mineshaft, the greater the amount of energy that can be collected from the system, and the bigger the mine, the greater the energy storage capacity of the plant.

**The Technology Behind Turning Abandoned Mines into Clean Energy Storage**

**Systems**

The technology behind turning abandoned mines into clean energy storage systems primarily focuses on using the underground caverns and chambers of the mines as sites for underground energy storage.

The technology behind turning abandoned mines into clean energy storage systems using underground gravity energy storage (UGES) is a novel concept that utilizes the earth's natural gravity to store energy. It uses abandoned mines as underground storage reservoirs for heavy materials, such as sand, rocks, or concrete blocks, which are raised and lowered within the mine to store and release energy.

**Benefits of Turning Abandoned Mines into Clean Energy Storage Systems**

Using abandoned mines as clean energy storage systems can provide a cost-effective and reliable way to store large amounts of energy. The underground caverns and chambers of the mines can be used as sites for underground energy storage.

This helps balance the supply and demand of energy and provides a way to store energy produced by intermittent renewable sources, such as solar and wind power.

The fact that mines already possess the necessary infrastructure and are interconnected to the power system greatly decreases the cost and enables the installation of energy storage plants.

Using abandoned mines for energy storage can also help reduce the environmental impact of mining by repurposing the mines for a practical purpose rather than leaving them as environmental hazards.

Repurposing abandoned mines as energy storage sites can help to revitalize economically depressed areas by creating jobs and economic development opportunities. It is a win-win scenario where an environmental problem is transformed into an opportunity to generate clean energy and benefit the local community economically.

**Limitations of Turning Abandoned Mines into Clean Energy Storage Systems**

There are several limitations to turning abandoned mines into clean energy storage systems. Firstly, not all abandoned mines can be used for energy storage. The mines need the appropriate geology, size, and location for viable storage sites. Mines closed for a long time may have structural or environmental issues that make them unsuitable for repurposing as energy storage sites.

Another limitation is that underground energy storage systems can be costly to construct, particularly if the mine requires extensive rehabilitation or reinforcement to make it safe for workers and equipment. The costs of developing the energy storage system, including equipment, installation, and maintenance, must be economically viable.

There is also a risk that the energy storage system could fail or malfunction, which could lead to environmental or safety hazards. Ensuring the energy storage system is designed and operated to minimize these risks is essential.

Obtaining the necessary permits and approvals from government agencies to repurpose a mine as an energy storage site could also be challenging. The regulations and requirements for repurposing a mine may vary depending on the location and the specific type of energy storage system proposed.

**The Future of Turning Abandoned Mines into Energy Storage Facilities**

Modifying abandoned mines into clean energy storage systems enables the efficient and economical storage of renewable energy.

UGES has the potential to provide long-duration energy storage, which can help balance intermittent renewable energy sources, such as wind and solar power.

It is anticipated that the worldwide potential for this technology ranges from 7 to 70 TWh, with the majority of this potential being in China, India, Russia, and the United States. However, it is still in the early stages of development, and further research is needed to determine its feasibility and commercial viability.

Source: Azo Mining