

Gravitational Energy Storage by Using Concrete Stacks

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Abstract : The paper aims to study the energy storage system in the form of gravity energy by the weight of concrete stacks. This technology has the potential to replace expensive battery storage. This paper is a trial plan in abandoned mines in Thailand. This is to start with construct concrete boxes to be stacked vertically or obliquely to form appropriate shapes and, therefore, to store the potential energy. The stored energy can be released or discharged back to the system by deploying the concrete stacks to the ground. This is to convert the potential energy stored in the concrete stacks to the kinetic energy of the concrete box movement. This design is incorporating mechanical transmission to reduce the height of the concrete stacks. This study also makes a comparison between the energy used to construct concrete stacks in various shapes and the energy to deploy all the concrete boxes to ground. This paper consists of 2 test systems. The first test is to stack the concrete in vertical shape. The concrete stack has a maximum height of 50 m with a gear ratio of 1:200. The concrete box weight is 115 tons/piece with a total stored energy of 1800 kWh. The oblique system has a height of 50 m with a similar gear ratio of 1:200. The weight of the concrete box is 90 tons/piece and has a total stored energy of 1440 kWh. Also, it has an overall efficiency of 65% and a lifetime of 50 years. This storage has higher storage densities compared to other systems.

Keywords : gravity, concrete stacks, vertical, oblique

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