STORAGE OF ELECTRICITY IN THE FORM OF GRAVITATIONAL ENERGY

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Abstract:
Generation of Power can be done by various methods some of them are renewable energy resources and rest are non renewable resources. All the methods are used to produce electrical energy. The energy whom is generated by renewable resources is not continuous for whole day (24 hrs.). Therefore not a single source is found who can harvest continuously for 1440 minutes.
A force that is present at every second of time is Gravitational force. Hence by suitable mechanism we can store Electrical energy in the form of Mechanical energy. The system is arrange in such a manner that kinetic energy of a mass due to the gravitational energy change its form in electrical energy.

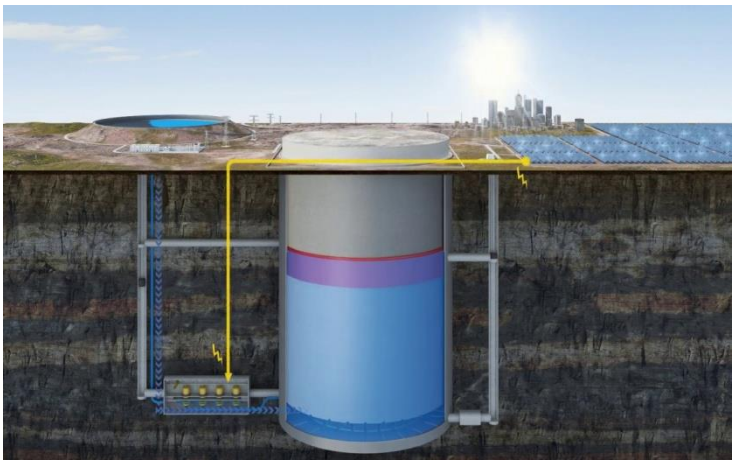
Introduction:
Our paper presents on is a present innovative methods of power storage by using the gravitational force. This force present at every place at every time on the Earth. Demand of energy is increasing in a rapid way day by day in the purpose of daily household use and for use industries. But day by day energy resources are degrading on large scale. According to today's scenerio energy resources would not be found in next few years hence there will be shortage of fuel like wood, coal, water etc. for power generation. This typeof energy resources known as non renewable energy resource. Now renewable energy resources like biomass, solar, wind are available for a fixed duaration only during the night and day. Now days we are using for the storage of energy are betteries and cells. They have many defaults like efficiency, life, cost, energy losses, etc. therefore this is time to look for different sources or mechanisms for store the energy by which we can utilize energy in the absence of generation of energy for fulfill the requirements and demands.

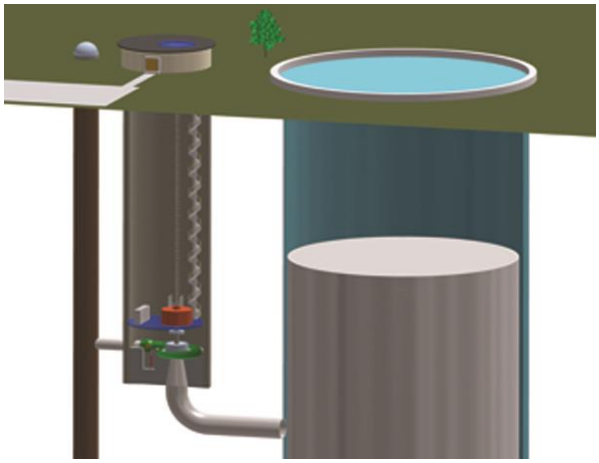
Principle:
The basic principle of the storage is the heavy weight of mass fall down due to gravity. Hence due to gravity the gravitational energy come in action and with the help of arrangement the gravitational energy converts its form in electrical energy.
Latest technologies on storage of electrical energy in form of gravitational energy:
There are so many mechanism to store electrical energy in form of gravitational energy.
Some of them we list and try to explain with our context.

Gravity Storage[1] :- This is the latest mechanism working for storage of energy. On this mechanism is formed by Heindl Energy and right now this company work on this project.Idea was given by Dr. Robert in 8April 2013.

In this project the energy of renewable resources is stored in this a array of solar,wind and other form of energy produced and stored in mechanism. By the help of solar we distribute energy for use and 30%of its energy used in pump for leveling the water or any other liquid. We fill water in underground in well which is perfectly useful and we pipe like structure beside the well and we put weight their like a piston.

For whole day process we compress water at constant speed and we push a weight at certain height in whole day, and when sun set then we release some water level or we put extra mass an piston side so turbine rotates and we produce electricity to reverse the process.This mechanism have 80% efficiency and cost is according to our requirements.





Img. - Gravity storage

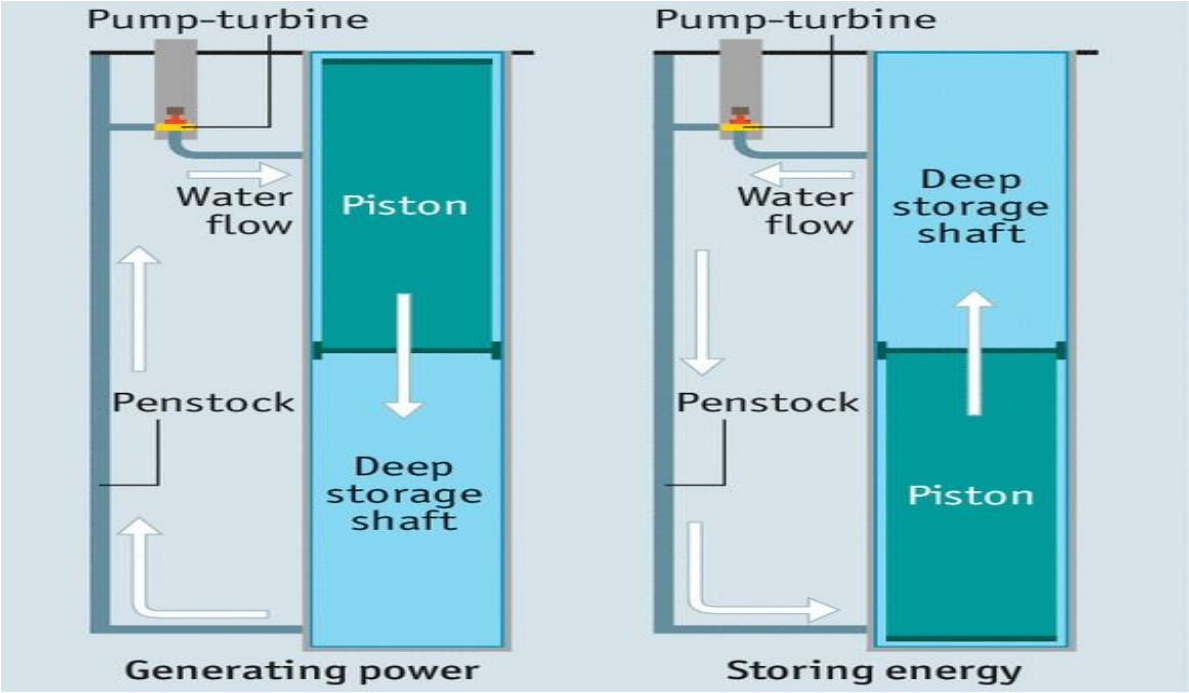
Two Shaft Mechanism[2] :-In this mechanism system requires pair of two shafts one of them long and another one is shorter in diameter . They both are connected to bottom and top. They are

making a closed circuit of from a reversible pump turbine. In the shafts fill the water they work as a flow of energy transfer. This mechanism work on a piston moving in a vertical direction.

When electricity is available in a sufficient manner, the pump turbine converts the power supplied by a motor generator (dual purpose motor generator) to potential energy, the water is pump on the larger shaft for the raise of the heavy piston. At the high demand, potential energy that is converted back to electrical energy by allow the piston to descend, for rotate the blades of turbine pump water molecules to be energized, it leads the power generation to the end of generator motor.

Power generation define as the speed of moving piston. Depth, mass of piston and diameter of piston define energy stored. In pump turbine friction losses are less and negligible at low piston speeds. This mechanism is efficient to store thousands of mega watt hours.

Its efficiency is 75-80%, low cost, no continue water use, good dynamic response, quick start, and zero emission and much better than fossil fuel power sources.

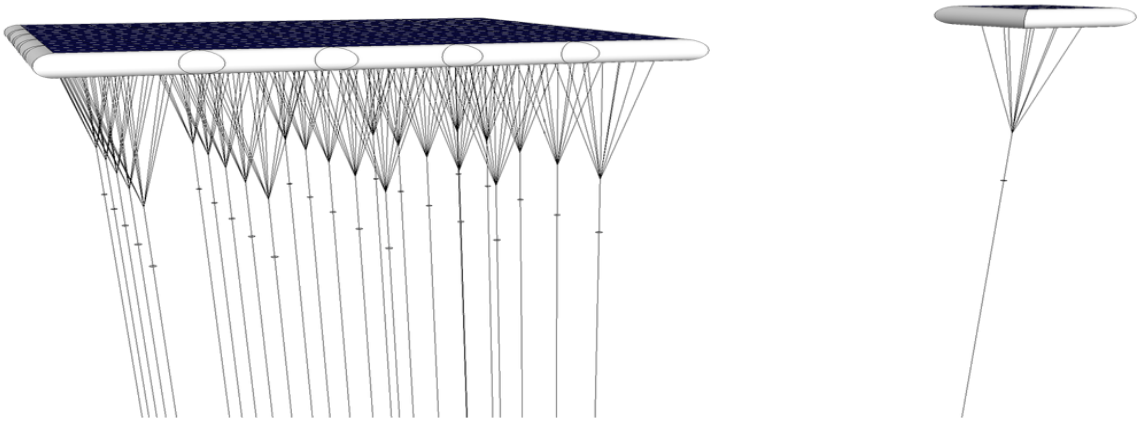


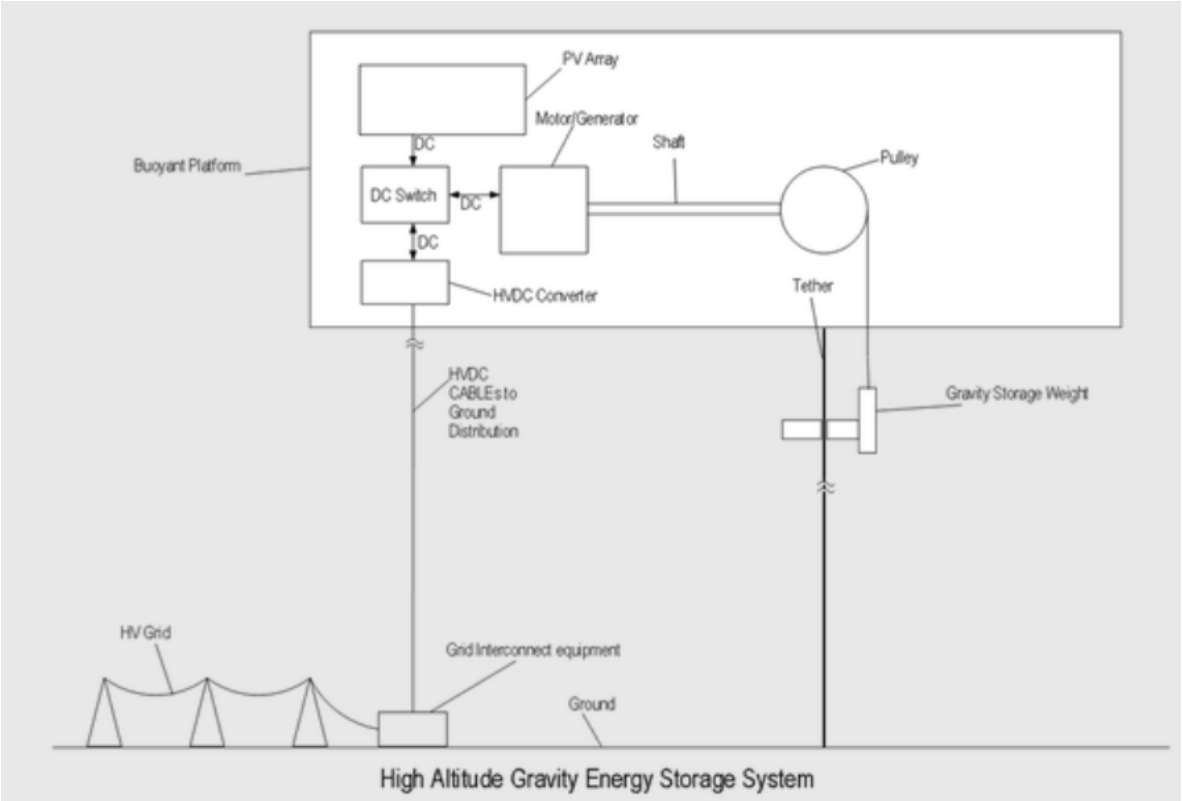
Two shaft mechanism

Air Solar Gravity Energy Storage[3] :- This energy storage stores energy stores energy by raising relatively small masses (hundreds of tonnes) from the ground to the buoyant platforms at 20,000 meters using electric motor/generator driven winches. This shows some close up views of the weights used to implement gravity energy storage. The weights are the small disks below the platforms on the tethers. This shows the small size and modular nature of the energy storage that matches the modular platform PV generation. Each kilogram of weight stores approximately 54Wh of energy when raised from ground level to 20km altitude. Each 500 tonnes of weight therefore stores about 25 MWh. The winches that raise and lower the weights are not visible in the drawings. They are suspended beneath the platform modules at the point where the support

cables join to evenly distribute the mechanical load.

The energy storage system is very simple, highly reliable, does not degrade with use, will last at least thirty years and has a high round trip efficiency of at least 85%. It is an integral part of the platform and as such has no geographic constraints. Storage scales naturally with PV electricity generation in units of about 25 MWh. The initial capital cost is about $125/kWh, which is better than any available or planned energy storage technology, and it will reduce in cost with volume production.





High Altitude Gravity Energy Storage System

Lifetime of 15,000 daily cycles, 30 year life, no power degradation as with batteries. Capital cost of $125/kWh initially, falling with volume production.85% round trip efficiency, grid to grid. Fast response for load following , Scale-able from kW to TW by adding platform elements and weights. No geographic site dependence on hills or caverns. Very little environmental impact due to small weights. Pumped storage and other large mass-small height, energy storage systems use over one hundred times the mass of water or rock and associated ground area.

Conclusion

Therefore after the comparison and study we conclude that energy storage mechanism like gravity storage, air solar gravity storage mechanism, two shaft mechanism are the best ways to store energy because they are working under natural force gravitational force it converts into kinetic energy. This force is very efficient. Power store by this mechanism can get any time. This units can be set up behind the rush area. In this sources we doesn't require any other things like fossil fuel, coal etc .Less losses than batteries and other equipments of store energy.

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Referance

[1] Prof. Dr. Eduard Heindl. 2018. Heindl Energy. [ONLINE] Available at: https://heindl-energy.com/. [Accessed 2 April 2018].

[2] Permaculture research. 2018. STORING ENERGY BY GRAVITY. [ONLINE] Available at: https://permaculturenews.org/2015/10/01/storing-energy-by-gravity/. [Accessed 2 April 2018].

[3] StratoSolar Inc.. 2018. Gravity Energy Storage. [ONLINE] Available at: http://www.stratosolar.com/gravity-energy-storage.html. [Accessed 2 April 2018].