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Commentary

Significance of Mechanical Energy Storage Technology

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DESCRIPTION

Energy storage is increasingly becoming a necessary component of power producing infrastructure. To balance supply and demand, energy storage is critical. When demand and supply fluctuate continually and rapidly over time, however, the grid, which serves as the interface for energy distribution, encounters a number of challenges in terms of managing generation and distribution. Different energy storage technologies can also be used to achieve grid balance [1]. For grid flexibility and stability, as well as to deal with the growing usage of intermittent renewable energy sources, larger amounts of energy storage are required [2]. New energy sources rely mostly on renewable sources in the context of distributed generation. As a result, an energy reserve is required, and energy storage can be extremely beneficial for effective energy management.

Need of energy storage systems and technologies

The need of using more renewable energy sources and reducing the usage of fossil fuels, as well as the development of the future smart grid, necessitates the development of energy storage systems. High generation costs during peak hours. The storage of electrical energy generated by low-cost power plants throughout the night and reintroduction into the power grid during peak demand periods has a significant potential for lowering total generation costs. The distance between generating stations and customers might be rather wide at times. As a result, there is a high risk of power outages owing to a variety of factors such as natural catastrophes or other factors such as overuse or operational accidents, which could disrupt the supply and potentially affect vast areas. As a result, energy storage systems and technologies are used to provide power on demand for a set length of time. Occasionally, there is a problem meeting power demand, as well as output power variations, which can be reduced by using energy storage systems, thereby stabilising the transmission and distribution grid.

Compressed air storage system

The air compression and accumulation in the deep cavern are the mainstays of this technology. Because it necessitates combustion in a gas turbine, it is classified as a hybrid generation/storage system. Heat is produced when air is compressed; if this heat is not stored, the compressed air, which contains natural gas and fuel, must be heated and ignited before being expanded in a turbine connected to a generator. To improve combustion efficiency and hence boost the efficiency of the CAES plant, some additional energy is put into preheating the stored air to prevent cooling and embrittlement of the turbine blades. Some additional energy is put into preheating the stored air to prevent cooling and embrittlement of the turbine blades to improve combustion efficiency and thus increase the efficiency of the CAES plant [3]. As a result, a new technique known as the Advanced Adiabatic Compressed Energy Storage System is used, in which heat created during compression is transmitted to additional heat storage locations *via* heat exchangers [4]. As the compressed air is exhausted, the heat accumulators supply the heat required to keep the compressed air from burning, which is required to prevent turbine blades from freezing, resulting in a carbon-neutral process.

SIGNIFICANCE

In the next years, storing huge amounts of energy to meet demand during peak hours will be a difficulty. Currently, the most cost-effective approach for this is to add pumped water storage. The CAES adiabatic systems are another alternative to hydro-storage pumping systems, and they are likewise very efficient [5]. The most important properties of mechanical energy storage systems currently under research in energy system design are presented in this paper. It defines the key characteristics that define the behaviour of different mechanical energy storage methods.

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