Superconducting Magnetic Energy Storage

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Superconducting Magnetic Energy storage (SMES)

- Superconducting magnetic energy storage (SMES) systems store energy in a magnetic field.
- This magnetic field is generated by a DC current traveling through a superconducting coil. In a normal wire, as electric current passes through the wire, some energy is lost as heat due to electric resistance.
- However, in a SMES system, the wire is made from a superconducting material that has been cryogenically cooled below its critical temperature.
- As a result, electric current can pass through the wire with almost no resistance, allowing energy to be stored in a SMES system for a longer period of time. Common superconducting materials include mercury, vanadium, and niobium-titanium.
- The energy stored in an SMES system is discharged by connecting an AC power convertor to the conductive coil
- SMES systems are an extremely efficient storage technology, but they have very low energy densities and are still far from being economically viable.

Advantages over other energy storage methods

- There are several reasons for using superconducting magnetic energy storage instead of other energy storage methods.
- The most important advantage of SMES is that the time delay during charge and discharge is quite short.
- Power is available almost instantaneously and very high power output can be provided for a brief period of time.

- Other energy storage methods, such as pumped hydro or compressed air, have a substantial time delay associated with the energy conversion of stored mechanical energy back into electricity.
- Thus if demand is immediate, SMES is a viable option. Another advantage is that the loss of power is less than other storage methods because electric currents encounter almost no resistance.
- Additionally the main parts in a SMES are motionless, which results in high reliability.