ENERGY STORAGE BASICS

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Distributed energy management technologies include energy storage devices. Energy storage technologies are essential for meeting the levels of power quality and reliability required by high-tech industries.

Energy Storage Technologies include: batteries, compressed air, flywheels, pumped hydropower, supercapacitors, superconducting magnetic energy.

Batteries are the most common device used for storing electrical energy. Specifically advanced batteries, flow batteries and lead-acid batteries can be used as storage devices.

Compressed air energy storage is really a hybrid storage/power production system. Off-peak electricity is used to power a motor/generator that drives compressors to force air into an underground storage reservoir, such as a rock cavern or abandoned mine.

A flywheel is a cylinder that spins at very high speeds, storing kinetic (movement) energy. The faster the flywheel spins, the more energy it retains. Energy can be drawn off as needed by slowing the flywheel.

Pumped hydro facilities use off-peak electricity to pump water from a lower reservoir into one at a higher elevation. When the water stored in the upper reservoir is released, it is passed through hydraulic turbines to generate electricity. Thus, two reservoirs in combination can be used to store electrical energy for a long period of time, and in large quantities.

Supercapacitors are electrochemical storage devices that work like large versions of common electrical capacitors. Supercapacitors store their energy in an electrostatic field. The energy is stored as a charge or concentration of electrons on the surface of a material.

Superconducting magnetic energy storage systems store energy in the magnetic field created by the flow of direct current through a large coil of superconducting material that has been super-cooled. In low-temperature superconducting materials, electric currents encounter almost no resistance, greatly enhancing their storage capacity.

Energy storage is important for other distributed energy devices by giving them more load-following capability, and also supports renewable technologies such as wind and solar electricity by making them dispatchable.

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