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New technology and possible advances in energy storage â˜†

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Abstract

Energy storage technologies may be electrical or thermal. Electrical energy stores have an electrical input and output to connect them to the system of which they form part, while thermal stores have a thermal input and output. The principal electrical energy storage technologies described are electrochemical systems (batteries and flow cells), kinetic energy storage (flywheels) and potential energy storage, in the form of pumped hydro and compressed air. Complementary thermal storage technologies include those based on the sensible and latent heat capacity of materials, which include bulk and smaller-capacity hot and cold water storage systems, ice storage, phase change materials and specific bespoke thermal storage media.

For the majority of the storage technologies considered here, the potential for fundamental step changes in performance is limited. For electrochemical systems, basic chemistry suggests that lithium-based technologies represent the pinnacle of cell development. This means that the greatest potential for technological advances

probably lies in the incremental development of existing technologies, facilitated by advances in materials science, engineering, processing and fabrication. These considerations are applicable to both electrical and thermal storage. Such incremental developments in the core storage technologies are likely to be complemented and supported by advances in systems integration and engineering. Future energy storage technologies may be expected to offer improved energy and power densities, although, in practice, gains in reliability, longevity, cycle life expectancy and cost may be more significant than increases in energy/powerdensity per se.

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Keywords

Flow batteries; Energy storage; Thermal storage

â˜† While the Government Office for Science commissioned this review, the views are those of the author(s), are independent of Government, and do not constitute Government policy.

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