

Options for the energy storage of renewable energy

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Building resilience into our engineered society (mitigation).

The paper will review the existing and promising schemes for the storage of energy in electrical, chemical or thermal forms. It will highlight the two main storage categories that are:

- Seasonal storage (increase of hydro dam height, synthetic fuels, heat and cold storage with shallow geothermal wells, ...)
- Daily or weekly storage (pump-turbine hydro, electrochemical with batteries and reversible fuel cells, compressed air or CO₂cycles, thermal using sensible or latent heat)

Updated diagrams like efficiency versus number of cycles or specific cost of the different technologies will be shown. The synergy between some of these approaches will be discussed as well as the associated considerations of energy performance, economics, life cycle and societal acceptation. Special attention will be given to advanced approaches using original CO₂cycles and urban networks for both heating, cooling and synthetic fuels production and use. One such (still partial) approach has been shown theoretically to save more than 80% of primary energy in an existing district. Future prospects original decentralized hybrid Solid Oxid Fuel Cell-Gas turbine (SOFC-GT) with efficiencies above 65% and with or without CO₂separation will be discussed. Moreover synergies between some advanced transportation technologies like plug-in hybrid vehicles and the electric grid will also be mentioned.