

Energy Storage in Salt Caverns – Today and Tomorrow

Sabine Hübner, Fritz Crotagino, KBB Underground Technologies GmbH, Hannover, Germany

Abstract:

Salt rock is of enormous importance to the energy industry worldwide as an excellent host rock for storage caverns: the main applications to date have been for the storage of crude oil and, even more, natural gas. Important new applications arise from the transition from fossil fuels to renewable energies such as wind and solar power, which are characterised by strong short term fluctuations, as well as long term seasonal fluctuations.

80% of today's primary energy consumption is supplied by fossil fuels: coal, oil and natural gas. The high volumetric energy density of these fuels enables large volumes of energy to be stored or stockpiled to compensate for imbalances between the steady production of fossil fuels and the fluctuating consumption of secondary energy carriers such as electric power, fuel and heat.

Climate change and the growing shortage of fossil fuels means a change in future to a growing share of renewable energies - with an

important role being played by wind and solar power. Both of these energy forms have one thing in common: large short term and long term seasonal fluctuations, no demand-oriented production, no means of storing the primary energy (wind, sun), and only limited means of directly storing the generated electrical power.

The required storage of the resulting power output at a grid scale will mainly take place in future indirectly by storing compressed air and hydrogen in salt caverns. This paper presents the current state of development in Germany of adiabatic compressed air storages which boost efficiency by also storing the compression heat. It also reports on the results of a major recent study based on a technical/ economic comparison of compressed air energy storages for short term applications, and hydrogen storages for long term applications, both in salt caverns. The separate parts of each system are explained and compared with alternative storage systems, looking at efficiency, capacity and potential applications.