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Economical Operation of Wind-Hydrogen-Systems with the Inclusion of a Salt Cavern Storage

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Abstract

The transformation of the German energy system to renewable energies continues to progress dynamically. The aim is to achieve an 80 % renewable electrical power supply while simultaneously halving the primary energy consumption by the year 2050. The utilization of temporary excess of electrical power from renewable energy sources through conversion and storage in salt caverns is seen as an essential technology and is currently being extensively discussed in Germany both technically and socially.

As a part of the study „Integration of Wind-Hydrogen-Systems into the Energy System“ (published summer 2013), commissioned by the Federal Ministry of Transport (BMBVS) represented by the National Organisation for Hydrogen and Fuel Cell Technology (NOW GmbH), conditions were determined, under which Wind-Hydrogen-Systems, consisting of electrolysis, storage in salt caverns and consumption via re-electrification or mobility, could be technically and economically feasible in 2030. Further priorities of the overall study were the convertible shares of wind power into hydrogen, the technical and economical characteristics of the whole system and its components, the use of hydrogen in various market segments such as energy or mobility, and a possible profitability of the system. Beside the other authors[1] of the study, KBB Underground Technologies GmbH took part in the study for the integration of a salt cavern as a large scale storage for hydrogen. This incorporated an intensive examination of the interaction of the cavern with the other components of the system, the performance and the development requirements of a salt cavern storage in a Wind-Hydrogen-System for the use of surplus power.

The aim of this paper is, on the one hand, to present the whole system with its potential economic applications and, on the other hand, to introduce a suitable cavern design according to the German safety requirements, including the performance and the R&D requirements.

Key words: Caverns for Hydrogen Storage.

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