**Lehrstuhl für Wirtschaftliche Staatswissenschaften,
insbesondere Energiewirtschaftslehre**

Bachelor Thesis

Underground Hydrogen Storage – Investigation of Technologies and Costs

Hydrogen is regarded as a promising element for establishing a climate-neutral energy system. However, due to the highly fluctuating power generation from renewable energy sources, hydrogen must be stored. Large-scale storage to support the energy system is deemed preferable in underground reservoirs.

In this context, salt caverns, which can be converted or newly constructed, are the preferred geological formation for storing hydrogen. Unlike natural gas, the storage of hydrogen in salt caverns is currently facing technical hurdles and uncertainties that impact the expected costs of storage. These arise along the process chain of brine extraction, compression, injection, purification, drying, conditioning, and feeding into the grid.

The objective of this thesis is to provide a detailed techno-economic overview of the various components of underground storage throughout the individual process steps of storing hydrogen. The aim is to determine cost ranges for each technical component of the underground hydrogen storage. By considering learning curves, future cost developments can be estimated.

Key tasks and objectives of the thesis

- Detailed familiarization with underground hydrogen storage
- Review of the theoretical and empirical literature on the current state of techno-economic aspects of underground hydrogen storage its components
- Evaluation of economic feasibility and potential, considering technology readiness levels and potential learning curves
- Calculation and comparison of current and future cost developments

Your profile

- Student of economics, best with focus on energy
- Interest in hydrogen, energy storage, energy transition,

Literature

- Bünger et al. (2016). “Large-scale underground storage of hydrogen for the grid integration of renewable energy and other applications”. In: Compendium of Hydrogen Energy, Pages 133-163
- Michalski et al. (2017). „Hydrogen generation by electrolysis and storage in salt caverns: Potentials, economics and systems aspects with regard to the German energy transition”. In: International Journal of Hydrogen Energy, Volume 42, Pages 13427-13443
- Zainul et al. (2022). “Projecting the levelized cost of large scale hydrogen storage for stationary applications”. In: Energy Conversion and Management, Volume 270

Contact

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Topics

- Underground Hydrogen Storage
- Energy Transition

Methods

- Techno-economic analysis
- Literature review