

Bachelor Thesis

Hydrogen markets – How do they look like and how do we model them?

Due to global efforts to reduce greenhouse gas emissions, a market for green hydrogen and derivatives from renewable energy sources (RES) is currently in its initial stages. The future market might have similarities and differences to existing energy commodity markets like natural gas or oil. A non-exhaustive list of similarities and differences is: First, while most countries worldwide have RE potential, large-scale potential with very low production costs is concentrated in only a few countries. Second, transport and storage costs for hydrogen are significantly higher than for derivatives, which could lead to different market developments for hydrogen compared to derivatives. Third, markets for hydrogen and derivatives are interconnected, as their production relies on the same RES potentials. Fourth, storage is of particular importance for market development, as it balances the volatility of RE production to meet demand at any given time. Since there are no real-world market examples yet, it is unclear how the markets for hydrogen and derivatives will develop. Model-based analysis of hydrogen and derivative markets can provide insights into the future development of these markets.

Key tasks and objectives of the thesis

In your thesis, you should first identify and describe the differences and similarities between hydrogen and hydrogen derivatives to already established energy commodities like natural gas and oil. From these differences and similarities, you should derive implications on how future markets for hydrogen and derivatives could be structured. Second, you should review existing work investigating the possible development of hydrogen markets and compare them with your findings. Third, you should derive requirements for how a hydrogen market can best be modeled to map the identified characteristics. Lastly, you should compare the derived requirements with existing models from the literature and identify potential research gaps and shortcomings in existing models.

Your profile

Student of economics or engineering, best with a focus on energy

Literature

Barner, Lukas (2024): A multi-commodity partial equilibrium model of imperfect competition in future global hydrogen markets. In *Energy* 311, p. 133284. DOI: 10.1016/j.energy.2024.133284.

Moritz, Michael; Schönfish, Max; Schulte, Simon (2023): Estimating global production and supply costs for green hydrogen and hydrogen-based green energy commodities. In *International Journal of Hydrogen Energy* 48 (25), pp. 9139–9154. DOI: 10.1016/j.ijhydene.2022.12.046.

Schlund, David; Antweiler, Werner (2023): The Emerging International Trade in Hydrogen and the Role of Environmental, Innovation, and Trade Policies. In *USAEE Working Paper No. 23-589*.

Schönfish, Max (2022): Charting the development of a global market for low-carbon hydrogen. In *EWI Working Paper No. 22/03*.

Contact



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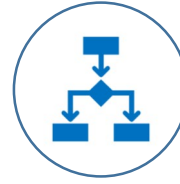
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Topics



- Hydrogen & derivatives
- Market models

Methods



- Literature review
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