Institute for Machine Tools and Industrial Management (*iwb*)
TUM School of Engineering and Design
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Methodology for decision-making in supply chain management of renewable hydrogen in the European Union

Motivation

The European Union (EU) is steadily progressing from conventional fossil-based energy sources to sustainable and renewable alternatives. Driven by imperatives such as the Paris Agreement, governments and institutions worldwide are committed to carbon-neutral practices. In this changing energy landscape, hydrogen emerges as a promising candidate, primarily when produced carbon-neutral. Moreover, the regulations do not clearly state when hydrogen production and usage can be considered carbon neutral.

Hydrogen, as a clean and versatile energy carrier, has the potential to replace fossil fuels such as natural gas in various industries. Its role in the energy transition is critical to achieving ambitious sustainability goals. However, hydrogen's unique chemical properties present challenges, particularly in transportation and storage.

Hydrogen's low energy density and tendency to permeate materials pose complex challenges for efficient and safe transport and storage. The need for specialized infrastructure and technologies further complicates the decision-making process for establishing a robust hydrogen supply chain. In addition, the imperative of carbon neutrality is shifting the focus to producing renewable hydrogen to ensure that the entire lifecycle of hydrogen, from production to end use, is consistent with environmental sustainability goals.

Objective

The research methodology for optimizing the transport and storage of renewable hydrogen in the EU involves a systematic approach. The first step is identifying geographical areas suited for efficient renewable hydrogen production, focusing on areas rich in solar and wind energy. This lays the foundation for understanding the energy market within

the EU, looking at sector-specific demand and pricing structures.

At the same time, the study extends to the challenges associated with hydrogen transportation and storage, addressing the unique chemical properties of hydrogen that pose barriers to these processes. In exploring the potential, various modes of transportation are considered, including gas pipelines and integration into the electricity grid, while also considering the impact of hydrogen's form – whether pure or mixed with other liquids or gases.

Bringing it all together, a comprehensive methodology synthesizes these findings. This methodology serves as a guide for companies, providing a roadmap for effective decision-making regarding the transport and storage of renewable hydrogen in the EU and ensuring alignment with market demands and sustainability goals.

Qualifications

- Currently studying or showing keen interest in areas like renewable energies and market dynamics
- Some exposure or a strong interest in supply chain management
- Demonstrated interest in self-directed learning and an openness to explore unfamiliar topics.
- Ability to convey thoughts and findings effectively in written form and verbally.
- Independent, determined, and structured way of working.
- Solid English communication and writing skills; German is beneficial.

Why *iwb*?

- personal and thematic supervision
- professional perspective at an excellent institute of the TUM

Contact

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