H2B-Roadmap for a gradual transformation of the steel industry and urban infrastructures with hydrogen in Bremen

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RESILIENTE ENERGIESYSTEME

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The need for reduction of CO_2 emissions will require a transformation of the steel manufacturing process in Bremen. This will imply the substitution of the fossil based process gas with green hydrogen. Through this transformation, new possibilities in manifold areas will arise at the Bremen industrial port. The roadmap aims to show the most cost efficient and ecological transformation path towards this goal.

Background

- Green hydrogen as promising energy carrier for the future
- Integration of a multi-MW electrolyser at the ArcelorMittal Bremen steel plant
- Direct use of product H_2 & O_2 as process gases
- Gradual elimination of fossil energy in the production process
- Storage and further distribution of H_2 in the city of Bremen and the north-western region of Germany, (see map)
- Sector coupling
- The electrolyser should serve as an energy-hub for the region, integrating stakeholders from society and industry

Image source: openstreetmaps.org

Objectives

- Analytical system evaluations for enabling a hydrogen economy in the region
- Multi-criteria assessment (MCDA) of hydrogen production, storage and distribution taking technical, economical, ecological and reliability (resilience) into account
- Dynamic Modelling of electrolysers with direct coupling to wind energy; on-grid, off-grid and grid connected operation
    - Flexibility potential
    - Detailed techno-economic assessment
- Socio-economic assessment of demand development and market ranges
    - Based on stakeholder dialogues
    - Scenarios for legal framing conditions
- Assessment of upper limit requirements for local production to identify H_2 import needs

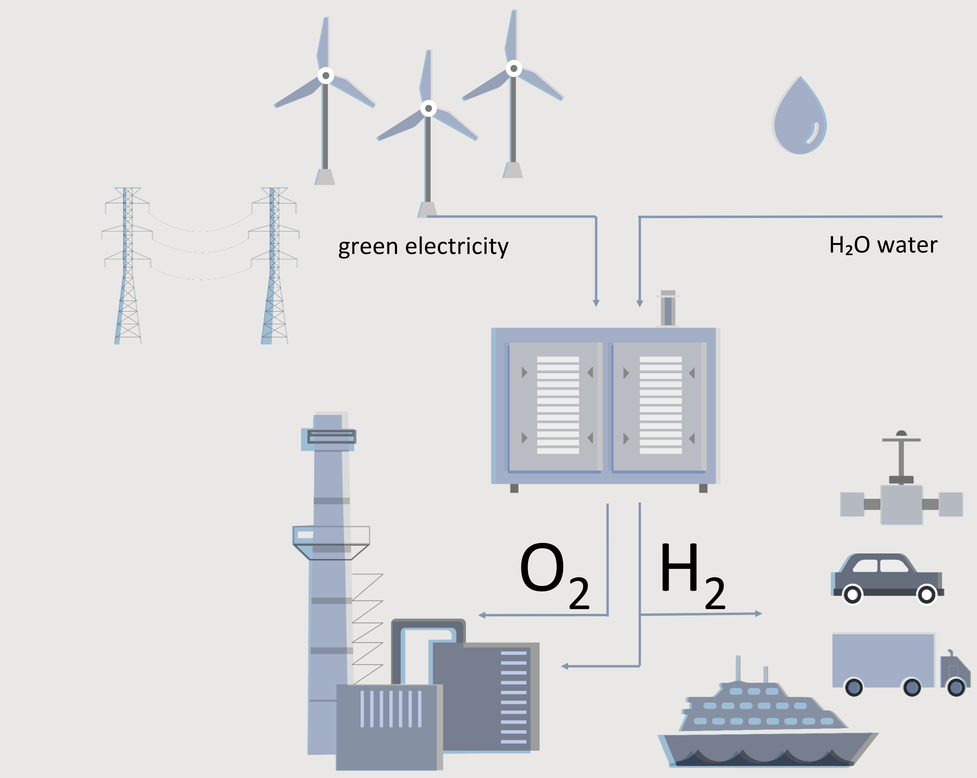

Figure 1: Schematic overview of the technologies involved in the project. ***Source: Authors' own compilation***

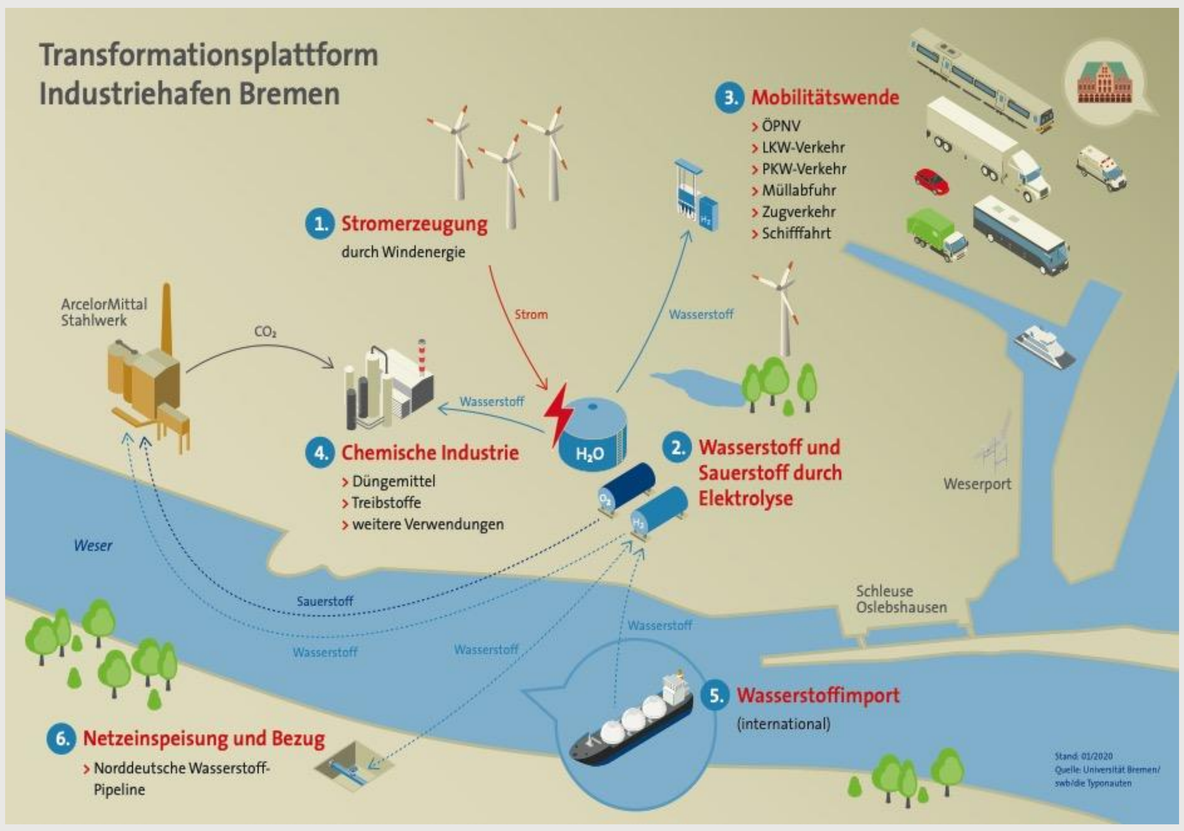

Figure 3: Schematic overview of the planned H2B transformation platform around the industrial port Bremen ***Source: adaptation of University Bremen swb / die Typonauten***

Partners

Joint research partners

Universität Bremen

RESILIENT ENERGY SYSTEMS

Professur für Volkswirtschaftslehre Innovations- und Strukturökonomik

Associated project partners

ArcelorMittal

INGAVER

wpd think energy

EWE

Other contributors

Freie Hansestadt Bremen

Figure 2: Scientific, associated and practise Partners of the H2B project. ***Source: Authors' own compilation***

Step-by-step approach of the Bremen's H2B-Roadmap

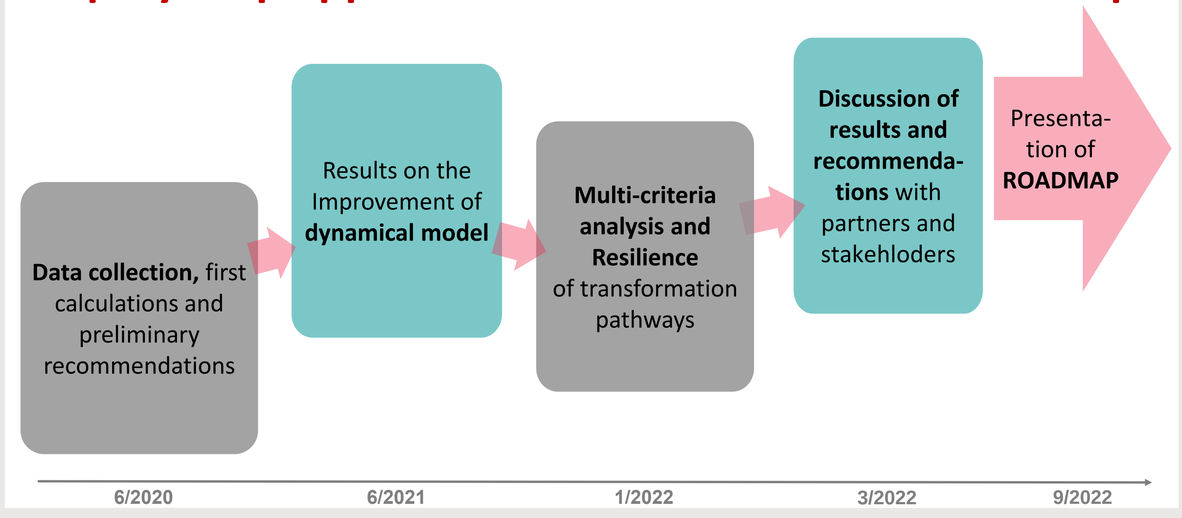

Figure 4: Illustration of the steps for development of the roadmap ***Source: Authors' own compilation***

Literature:

Schnülle, C.; Thöming, J.; Wassermann, T.; Thier, P.; Gleich, A. von; Gößling-Reisemann, S. (2019): Socio-technical-economic assessment of power-to-X: Potentials and limitations for an integration into the German energy system, Energy Research & Social Science, Volume 51, Pages 187-197, ISSN 2214-6296, https://doi.org/10.1016/j.erss.2019.01.017

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