

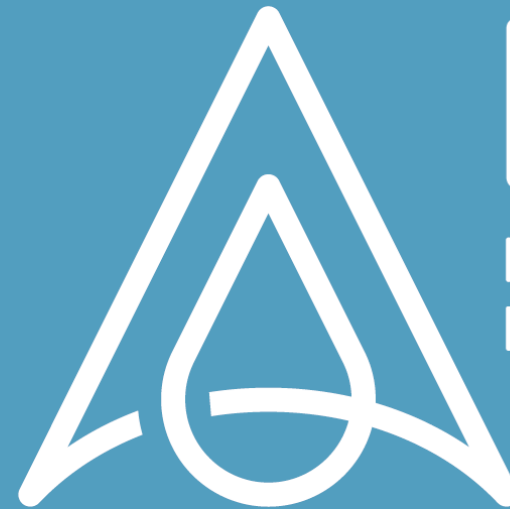
# Northern German Living Lab (NRL) – Energy Transition and Industrial Transformation through Hydrogen

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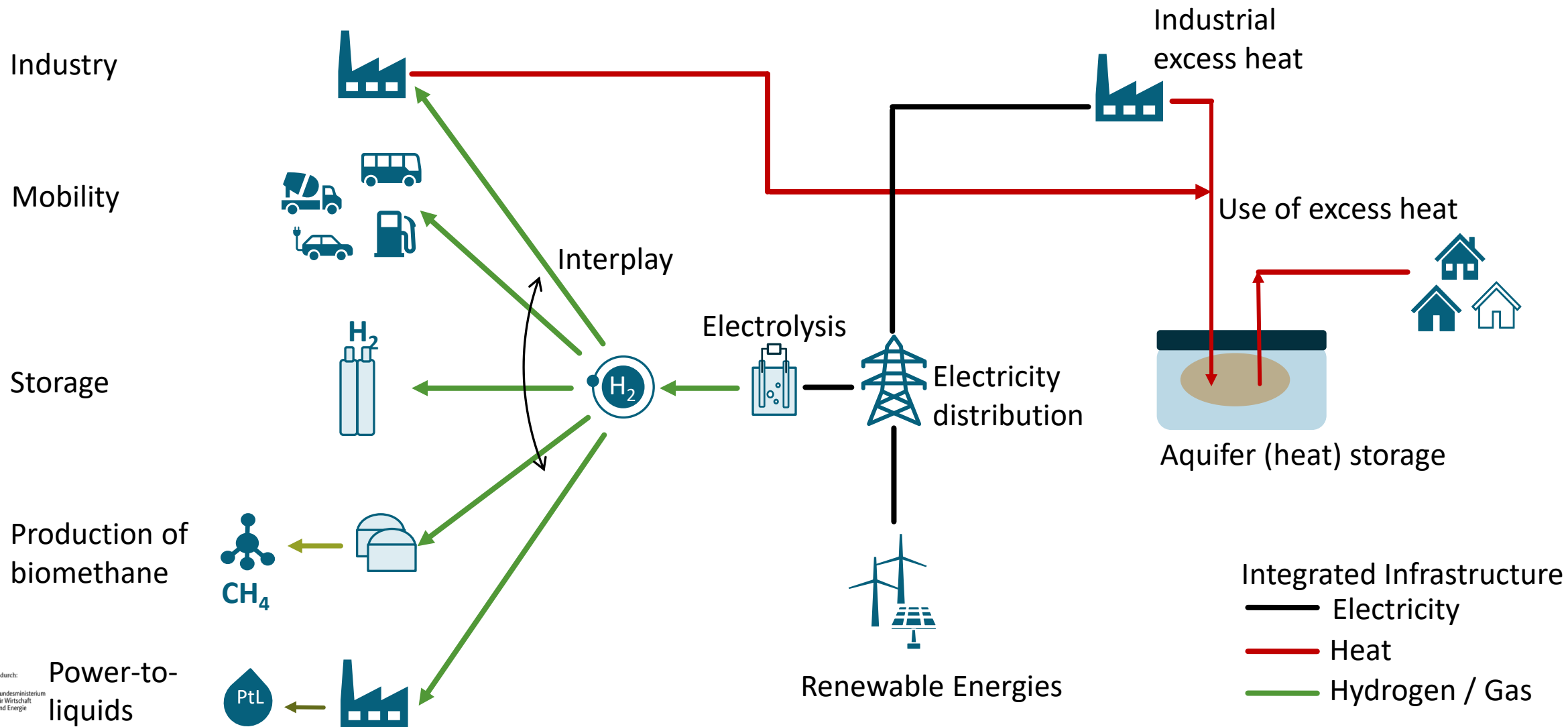
**NRL**

Norddeutsches  
RealLabor

- Security of energy supply – Climate neutrality in 2045
  - Massive reduction of dependence on fossil imports
  - Speeded-up expansion of renewable electricity production in Germany to enable defossilisation
  - Sovereignty of key technologies
- Global competition for climate protection technologies
  - Development of competitiveness of German companies
  - Transformation of industry modernizes and strengthens the industrial sites of Germany

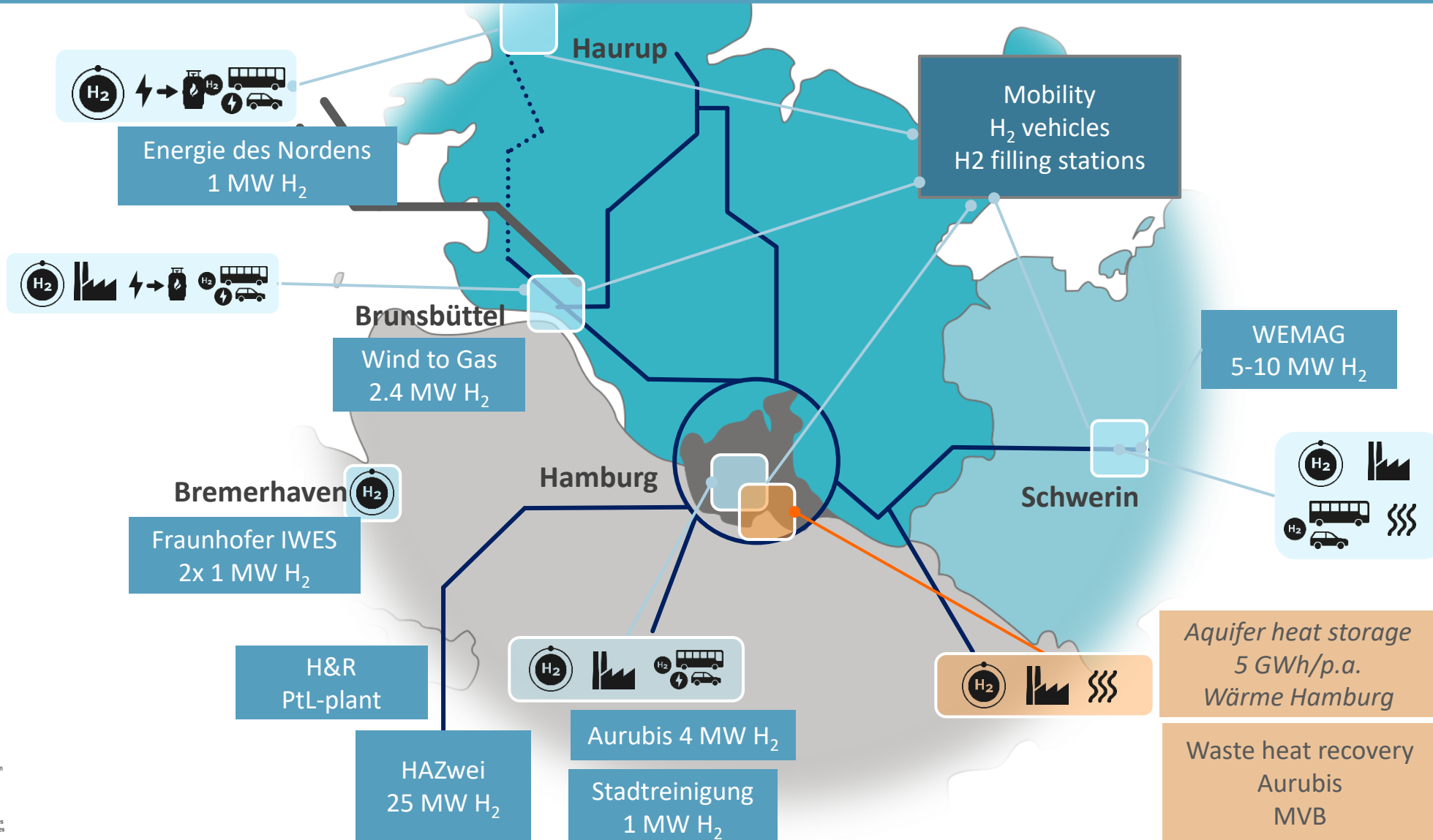


# Sector Coupling

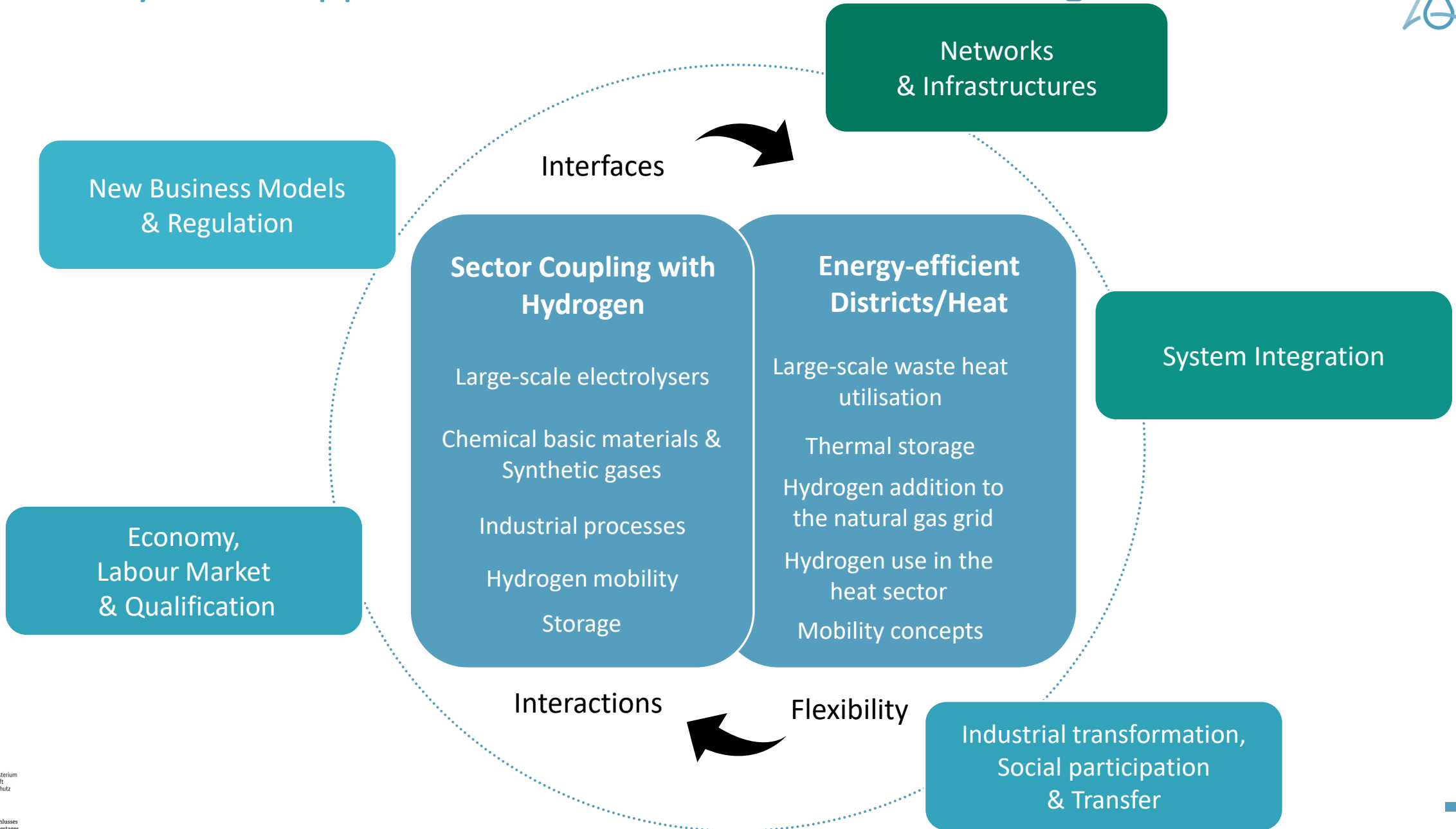


# Northern German Living Lab: integrated sector coupling & hydrogen

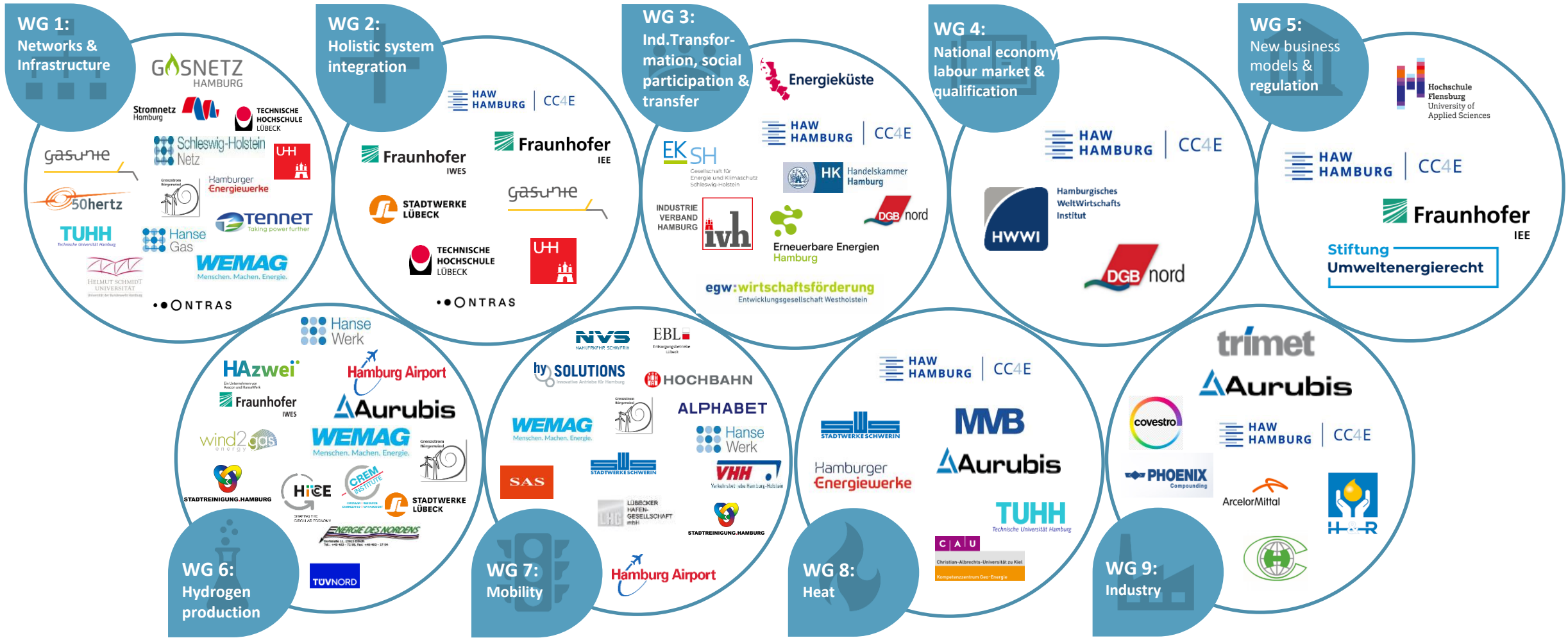
>50 partners, 25 projects with 22 demonstrators (8 electrolyzers), 42 MW H<sub>2</sub> generation, 700 GWh waste heat utilization, integrated systemic approach, more than 350 ktons CO<sub>2</sub> reduction



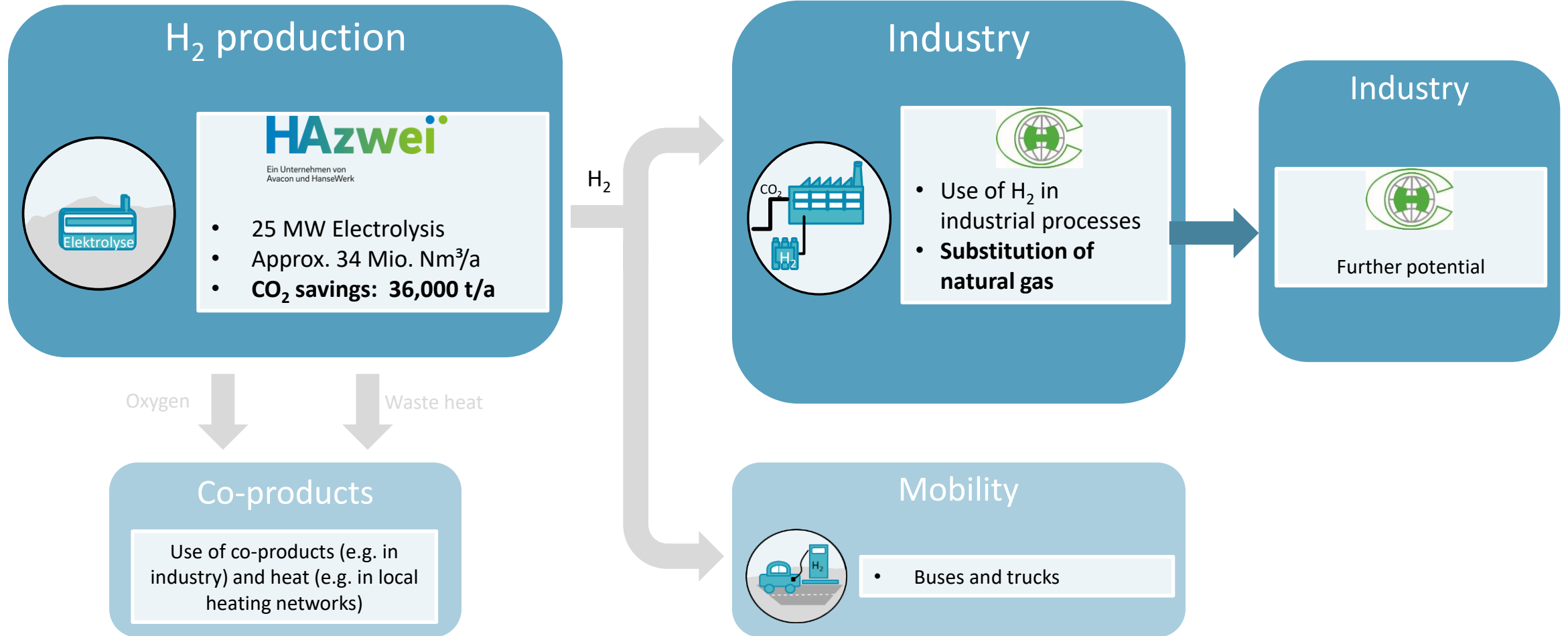
# Overall systemic approach of the Northern German Living Lab



# Interconnected working groups for overall systematic approach

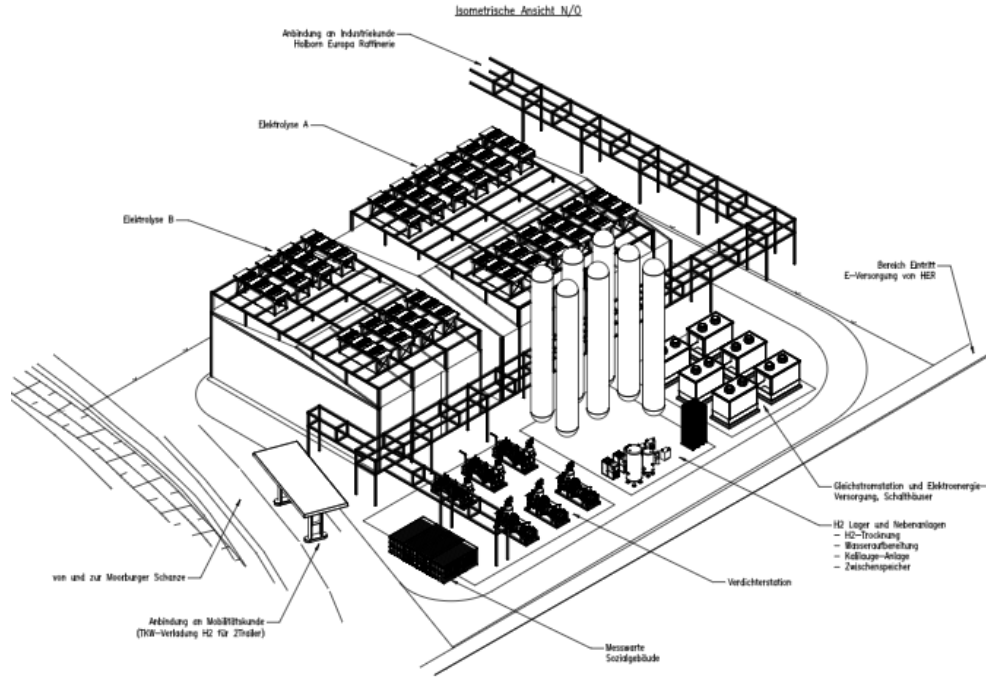


# Hub Hamburg – sector coupling with H<sub>2</sub> (industry)






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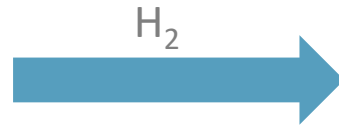


## H<sub>2</sub> production

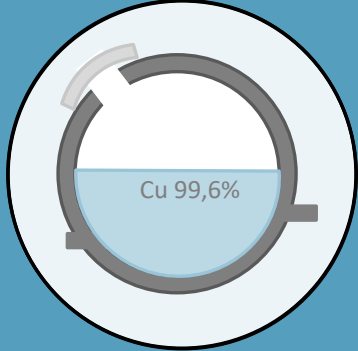


Elektrolysis

- 4 MW Electrolysis



## Primary copper production

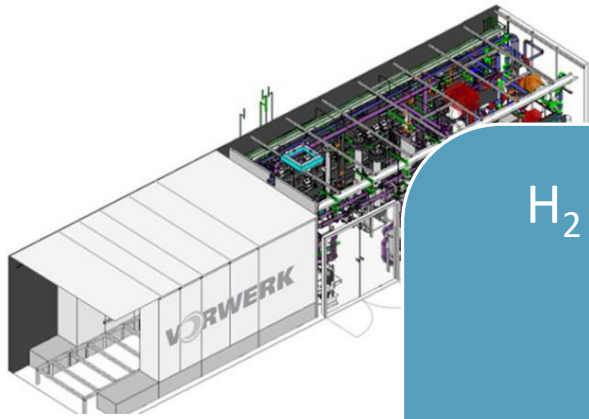


Cu 99,6%

- Usage for reduction of copper concentrate
- Addition to molten copper
- **Substitution of natural gas**
- Increased reduction efficiency
- **CO<sub>2</sub> savings: 6,200 tCO<sub>2</sub>/a**
- further expansion potential



# City cleaning authority (Stadtreinigung Hamburg): PtX and biowaste processing



## H<sub>2</sub> production

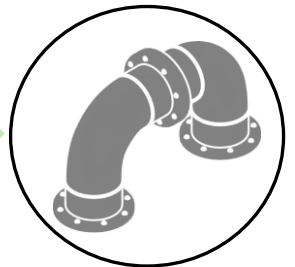
- 1.1 MW PEM electrolysis

H<sub>2</sub>

## Biomass fermentation

- Increase in the degree of methanation from 50% to 75% by in-situ methanation with H<sub>2</sub>
- Up to 250,000 Nm<sup>3</sup> additional methane per year
- **Substitution of natural gas**

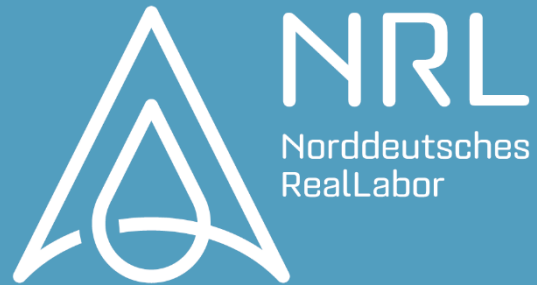
CH<sub>4</sub>



Natural gas network

↑ Biowaste





**Thank you very much for your attention!**

**More information: <https://en.norddeutsches-reallabor.de/>**

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