

Flexible sector coupling – Integration into the energy system of the future and impact of the regulatory framework



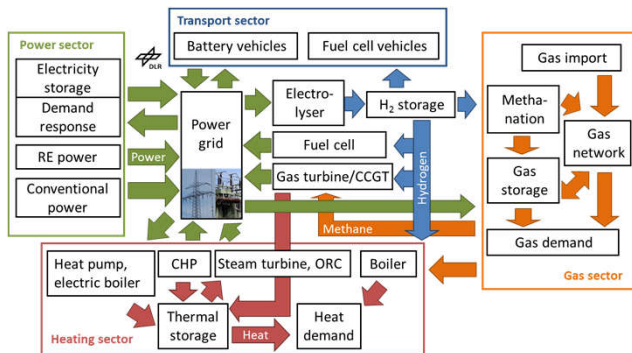
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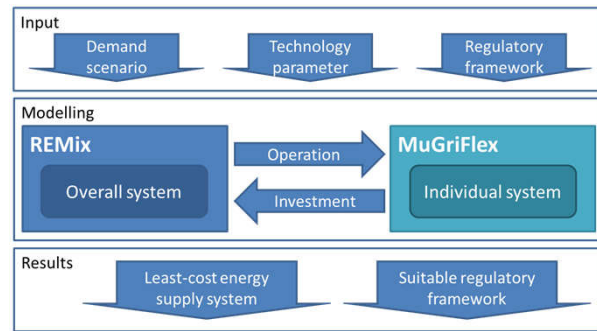
Project focus

- Evaluation of flexibility in future energy systems
- Integrated modelling of power, gas, heat & transport
- Interaction between sector coupling technologies
- Power demand flexibility in the gas system



Methodology

- Coupled application of two energy system models
- Comparison of macroeconomic & business perspective
- Analysis of the regulatory framework



Considered scenarios

- Myopic model application 2020, 2030, 2040, 2050
- Geographical scope: DE + neighbouring countries

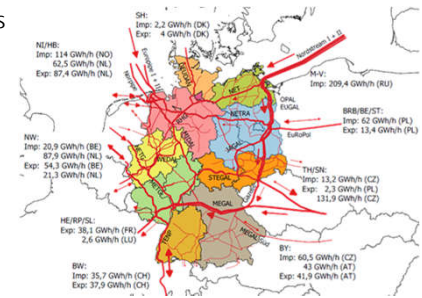
GHG80 (80% CO₂ reduction)

GHG95 (95% CO₂ reduction)

- Exogenously defined demand for power, CH₄, H₂ and heat
- Exogenously defined fuel and CO₂ emissions costs
- Higher CO₂ emission costs
- Increased power and H₂ demand in transport and heat sectors

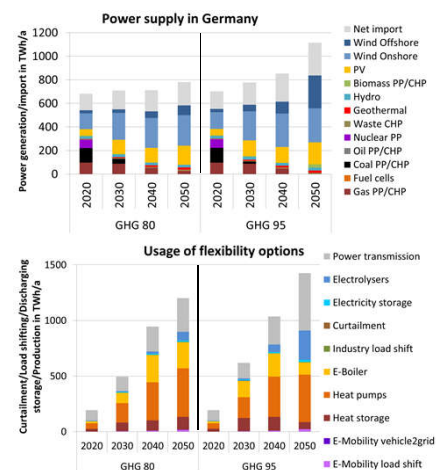
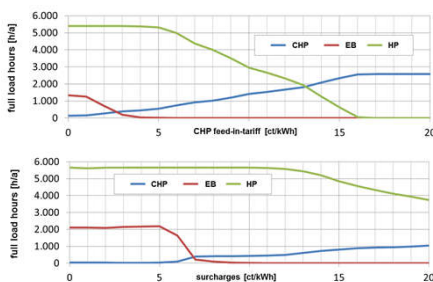
Consideration of today's gas infrastructure

- Integration of today's storage, compression and transport pipeline capacities
- Endogenous expansion of:
 - Transport pipelines
 - Storage (H₂, CH₄)
 - Electrolysers
 - Methanation
 - Gas pre-heating



Model results

- Synergetic interaction of flexible sector coupling technologies
- Flexible hydrogen production can contribute to RE balancing
- Heat networks to be supplemented with storage and heat pumps
- Partial rededication of the natural gas transport infrastructure to hydrogen can reduce system transformation costs



- Framework conditions have decisive influence on achieving targets
- Adjustments in framework conditions required to trigger investment and operation towards the economic optimum