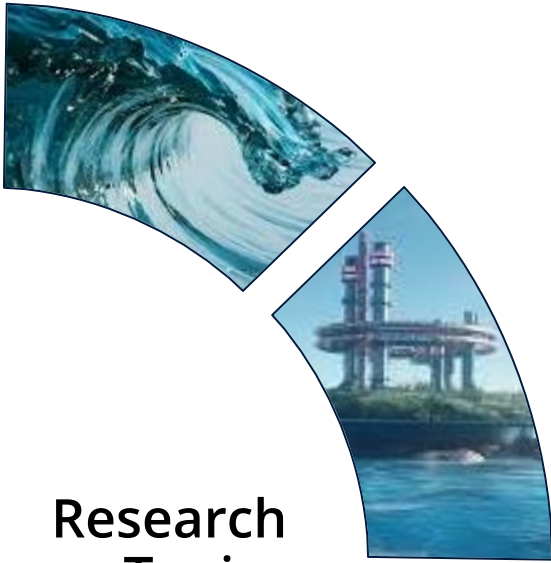




- **Power-to-X | System integration of renewable energies:** Development and system integration of demand-oriented PtX plants for sector coupling and decarbonization, especially on an industrial scale.
 - Focussing **on international projects** and their integration in local energy systems and economies. Considering the use of by-products and local value creation.
 - Investigating **transport** and **storage infrastructures** for H_2 and CO_2 for energy provision and decentralized supply.
 - **CO_2 capture** from point sources using innovative **refrigeration** technology. Integration in industries such as shipping.
- **Assessment of Energy Provision:** Developing and assessing climate change mitigation technologies and their environmental impact as well as their economic performance.
 - Life Cycle Assessment: Assessing the environmental impact. Dynamic Life Cycle Assessment (LCA) to account for the fluctuating nature of renewable energies
 - Techno-economic and environmental optimisation of plant layouts using MILP
 - Assessing and developing regulatory frameworks to achieve climate change mitigation
 - Carbon Management: Circularity of future carbon flows. Potentials of renewable carbon potentials



Prof. Dr.-Ing. Sebastian
Timmerberg



Research Topics



Prof. Dr.-Ing. Torsten
Birth-Reichert

- **Power-to-X | System integration of renewable energies:** Development and system integration of demand-oriented PtX plants for sector coupling and decarbonization, especially on an industrial scale. Interaction between different energy infrastructures and optimization of convergent systems.
 - Alternative H₂ and fuel production through **dark fermentation** and **plasma cracking**.
 - Development of **floating electrolysis platforms** and investigation of maritime forces. Energy-generating **flood protection** systems and breakwaters. **Underwater power plants**.
 - **CO₂ capture** from point sources using innovative **refrigeration** technology. Test bench and prototype development. Investigation of **trace elements** in CO₂ for capture.
 - Investigation of **transport** and **storage infrastructures** for H₂ and **CO₂** for energy provision and decentralized supply.
- **Energy efficiency and process optimization:** Evaluation and optimization of energy and material flows using simulation, key performance indicators, and new evaluation methods (including PHO according to VDI 4663).
 - Construction and development of a **degradation test bench** for investigating the long-term effects of flexible operation of **electrolysers** using PV, wind and hydroelectric power characteristics.
 - Investigation of **deuterium enrichment** in the **electrolysis system** with regard to degradation and targeted deuterium production.
 - Investigation of **evaluation methods** for complex **bio-** and **thermochemical processes**.
- **Resource efficiency and recycling:** Sustainable use and recovery of residual materials, technologies for circular economy.
 - **Hydrogen** production and storage **from metallic** and **non-metallic production** residues.
 - **Biogenic waste** utilization through plasma cracking for the production of **raw materials**.