Water treatment and supply in the hydrogen and Power-to-X industry

Type: Bachelor or Master Thesis or Study Project
Date: Immediately, by appointment
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Problem:
The transition into a decarbonized energy supply system goes in hand with the generation of (green) hydrogen and its downstream (Power-to-X) products from renewable energies. Water is an essential input in such facilities and must be supplied with a high quality to ensure their proper operation. Depending on the local conditions (i.e., onshore or offshore, energy sources, regulations) as well as the characteristics of the water resources and the target quality, different novel as well as established technologies may be implemented. Each of them having their respective operational advantages and challenges when applied in the hydrogen sector.

Task:
The aim of this work is the investigation of technologies such as nanofiltration, reverse osmosis, membrane distillation, electrodialysis, electrodeionization and ion exchange for desalination and supply of ultra-pure water. Along with the evaluation of ion retention, permeability, and surface layer formation at different conditions (pressure, temperature, pH, salinity), the focus is to investigate the influence of different modes of operation on the overall performance of the individual processes as well as of their possible combinations. Additionally, particular consideration shall be given to the fouling potential, reduction of energy consumption and modelling tools to describe these processes.