

Development of a Cost Model for the Techno-Economic Optimization of MW-Scale PEM Electrolyzers

Description:

Cathodic operating pressure is a key design parameter for large-scale PEM electrolyzers. Higher pressures reduce downstream compression costs (OPEX), but drive up capital expenditure (CAPEX) for the balance of plant (piping, valves, instrumentation) due to the higher pressure ratings required by standards. To identify the optimal plant design for the 1.5 MW OASES test facility and future scale-ups, component-level cost models are currently lacking. The goal of this thesis is to build a parametric cost database — based on real procurement data from test rigs already realized, as well as targeted acquisition of external manufacturer quotes. Building on this, a design tool will be developed to determine the economically optimal system pressure (Levelized Cost of Hydrogen – LCOH).

Content / Time table:

- Familiarization with PEM system architectures and established techno-economic assessment methods (0.5 months)
- Building a structured cost database through systematic evaluation of internal procurement data from realized test rigs, as well as new manufacturer quotes for various pressure ratings and nominal diameters (2 months)
- Mathematical derivation of scaling laws (cost functions) and implementation into a parametric cost model (1 month)
- Development of a design tool (Python/Excel) for automated CAPEX and LCOH calculation, including sensitivity and uncertainty analyses (1.5 months)
- Analysis of economic sweet spots, preparation of documentation, and writing of the thesis (1 month)

Paid Master Thesis

Start: Any time
Duration: approx. 6 months
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