Chair of Renewable and Sustainable Energy Systems
Department of Electrical and Computer Engineering
Technical University of Munich

Research Internship

# Life Cycle Costing of PEM Electrolyzers

## Background

This research internship focuses on the comprehensive analysis of the life cycle costs associated with Proton Exchange Membrane (PEM) electrolyzers. PEM electrolyzers are pivotal in the production of green hydrogen, a key component in the transition to sustainable energy systems. Life Cycle Costing (LCC) is a method used to assess the total cost of ownership of a product over its entire life span, including initial investment, operation, maintenance, and disposal costs. The work involves researching and employing LCC methodologies to evaluate these cost factors. The findings will contribute to the understanding of hydrogen production costs.

## Requirements

- Familiarity with LCC methodologies.
- Prior experience in conducting literature reviews, data collection, and analysis.
- Strong written and verbal communication skills for preparing reports and presentations.
- Independent and structured working

## Expected work

- Data Collection and Analysis: Gather data on the costs associated with the manufacturing, operation, and maintenance of PEM electrolyzers from various sources, including industry reports and academic papers.
- LCC Model Development: Develop an LCC model to quantify the total cost of ownership of PEM electrolyzers.
- Scenario Analysis: Conduct scenario analyses to evaluate the impact of different technological advancements on the life cycle costs of PEM electrolyzers.
- Reporting and Recommendations: Prepare a comprehensive report summarizing the findings and sources.

## Literature

Life Cycle Costing (LCC)
[1] J. M. Ogden, Life-cycle cost (LCC) applied to hydrogen technologies: a review, International Journal of Hydrogen Energy, vol. 43, no. 3, pp. 1185-1200, Jan. 2018.
[2] A. K. Biswas, Literature review of life cycle costing (LCC) and life cycle assessment (LCA), Journal of Cleaner Production, vol. 17, no. 10, pp. 1231-1240, Jul. 2009.
[3] Royal Institution of Chartered Surveyors (RICS), RICS professional guidance, UK Life cycle costing, 1st ed., London, UK: RICS, 2016.
PEM Electrolyzers

[4] S. A. Grigoriev, V. N. Fateev, D. G. Bessarabov, and P. Millet, PEM water electrolysis for hydrogen production: fundamentals, advances, and prospects, International Journal of Hydrogen Energy, vol. 45, no. 5, pp. 26036-26058, Mar. 2020.
[5] M. Carmo, D. L. Fritz, J. Mergel, and D. Stolten, Effect of Components and Operating Conditions on the Performance of PEM Electrolyzers: A Review, Journal of Power Sources, vol. 287, pp. 743-755, Apr. 2015.
[6] A. Ursua, L. M. Gandia, and P. Sanchis, Global Trends in PEM Electrolyzer Research Based on Bibliometric Analysis, Renewable and Sustainable Energy Reviews, vol. 81, pp. 290-294, Jan. 2018.
[7] J. Gerhardt-Mörsdorf et al., Life Cycle Assessment of a 5 MW Polymer Exchange Membrane Water Electrolysis Plant, Advanced Energy and Sustainability Research, vol. 5, no. 4, p. 2300135, 2024, doi: 10.1002/aesr.202300135.

## Contact

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