Environmental impacts of electrolyser technologies for green hydrogen

Level: Master

Start: Before March 2024

Duration: 5 months (30 EC)

Project form/methods: Life cycle assessment, analysis of literature and industry data

Department(s): Environmental Science

External host organisation: Battolyser

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Background

Hydrogen is expected to become an important element in the transition towards a net-zero greenhouse gas (GHG) emissions society. It can contribute as an energy carrier to the decarbonisation of transport and energy systems, but can also serve as a feedstock for the chemical industry. Currently, 100 million tonnes of hydrogen are produced per year, almost entirely based on fossil fuels. This market is projected to grow towards 300-800 Mt/yr of so-called green hydrogen. This green hydrogen is produced using electrolysers that split water in hydrogen and oxygen using renewable electricity. To enable truly "green" hydrogen production, the electricity that is used should be renewable and low-emission, but other components in the supply chain should also have low environmental impacts. One crucial element in the supply chain is the electrolyser itself.

Aim & approach

In this joint project between Radboud University and the private company *Battolyser*, you will use life cycle assessment to evaluate the environmental impacts of the combined battery and electrolyser system produced by *Battolyser*. You will contrast this system with other electrolyser types. The life cycle assessment will consist of: i) setting the goal, scope and system boundaries (i.e., what system is exactly analysed and how), ii) constructing a life cycle inventory based on actual industry data from Battolyser supplemented with LCA databases, iii) life cycle impact assessment using the tools and expertise available at Raboud, followed by: iv) a thorough analysis of the environmental impacts and benefits of the Battolyser system and alternative options, as well as the consequences for the environmental profile of the produced green hydrogen. The focus of the LCA will be on the production of the hydrolyser-battery system.