Master’s Thesis

## Sustainability competitiveness of novel and commercialized upgrading technologies in Germany

## Background

Biomethane production has attracted lots of attention as a sustainable approach to overcoming energy scarcity. In this context, Germany is the leading country by holding the highest number of biogas upgrading plants among other European countries. Currently, physicochemical technologies are broadly implemented in which CO2 is removed or separated from methane-rich biogas. Water scrubbing, chemical absorption using amine solution, pressure swing adsorption, membrane separation, and physical scrubbing with organic solvents are the most commercialized physicochemical upgrading technologies in Germany. On the contrary, a newly introduced upgrading method so-called “methanation technology” transforms the CO2 content of biogas into bio-methane either biologically or chemically. The conversion of CO2 into methane increases the overall efficiency of the process and brings about more revenue. However, the environmental impacts of this technology should be assessed to compete against its main commercialized counterparts.

## Goals

The goal of this master thesis is to assess the environmental performance of a commercialized biogas upgrading technology versus the methanation process. To this end, mass and energy flows are analyzed as the basis for LCA modeling. Then LCA scenarios are modeled in LCA software to quantify the environmental impacts of the evaluated technologies.

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