

# MORE BIOMETHANE FROM BIOGAS BY POWER-TO-GAS – LEARNING FROM FIELD TESTS, SIMULATIONS AND UP-SCALING STUDIES

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## AIM

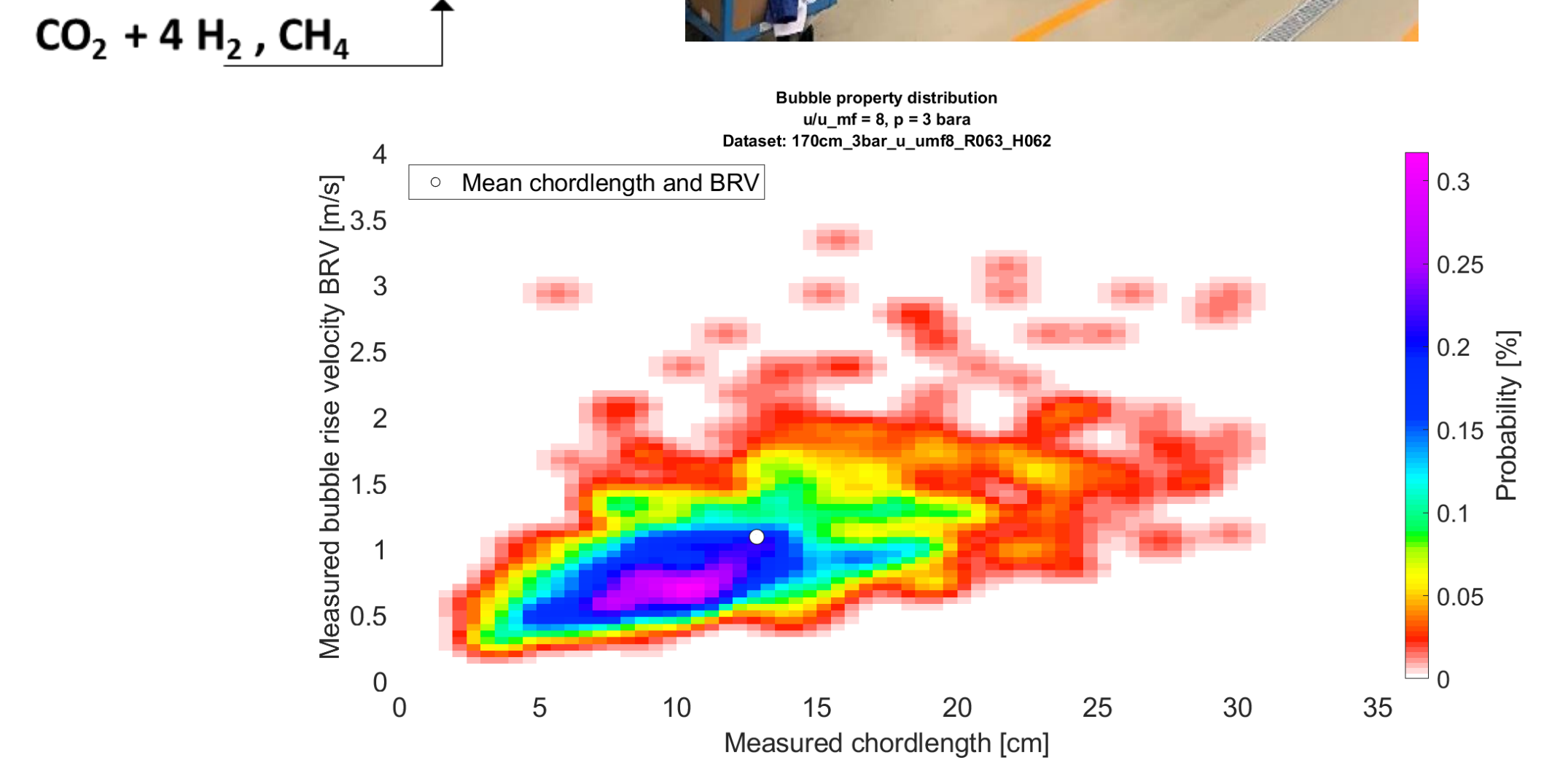
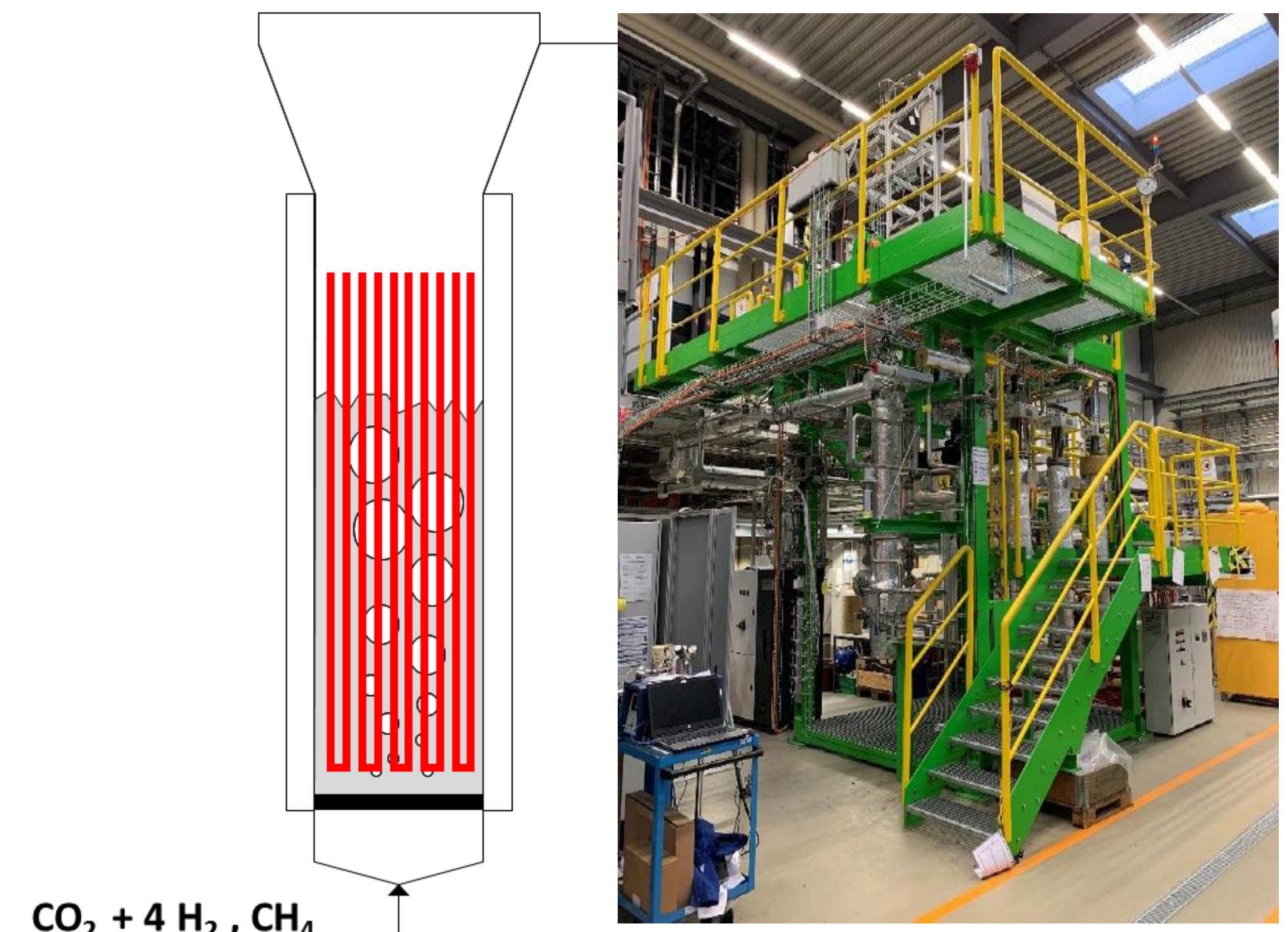
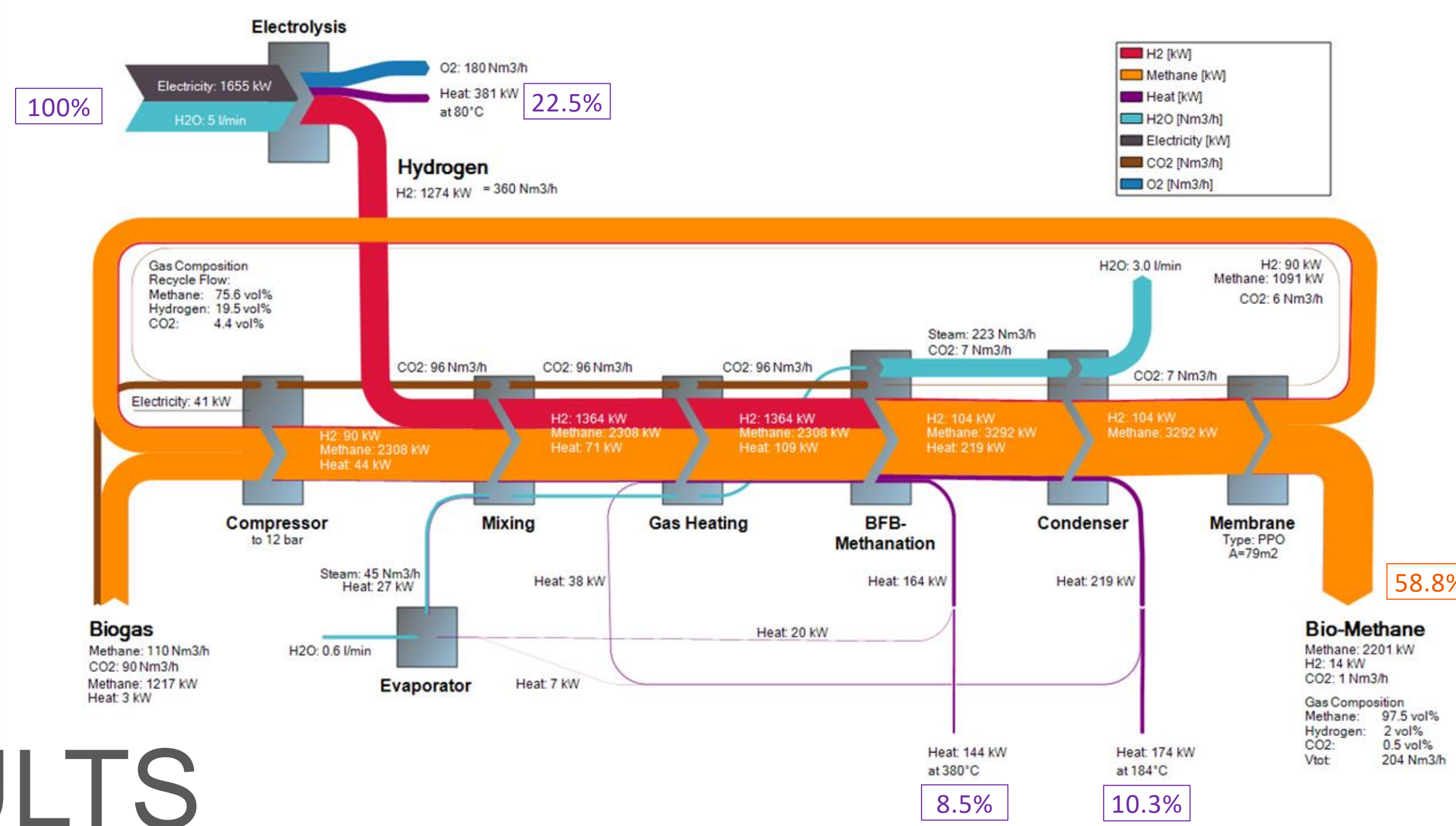
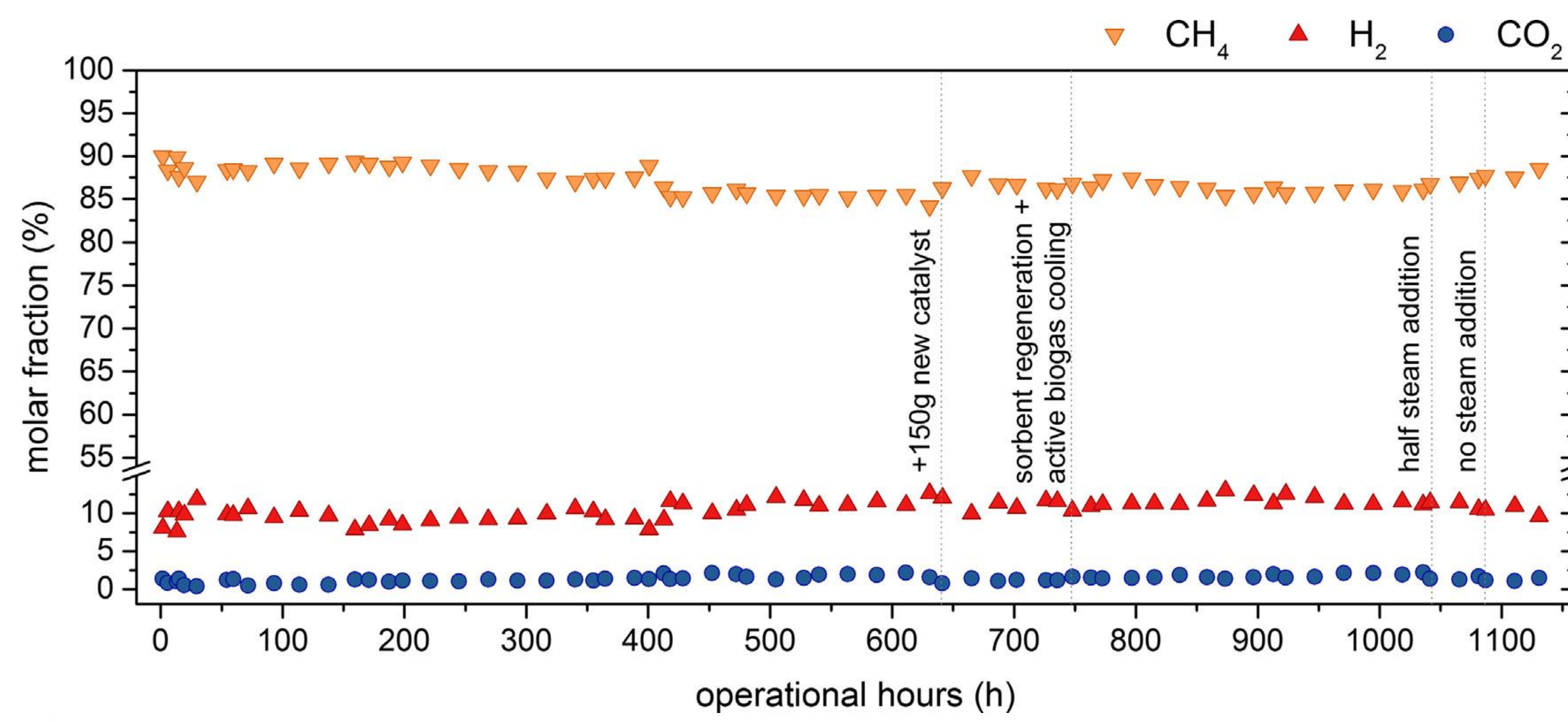
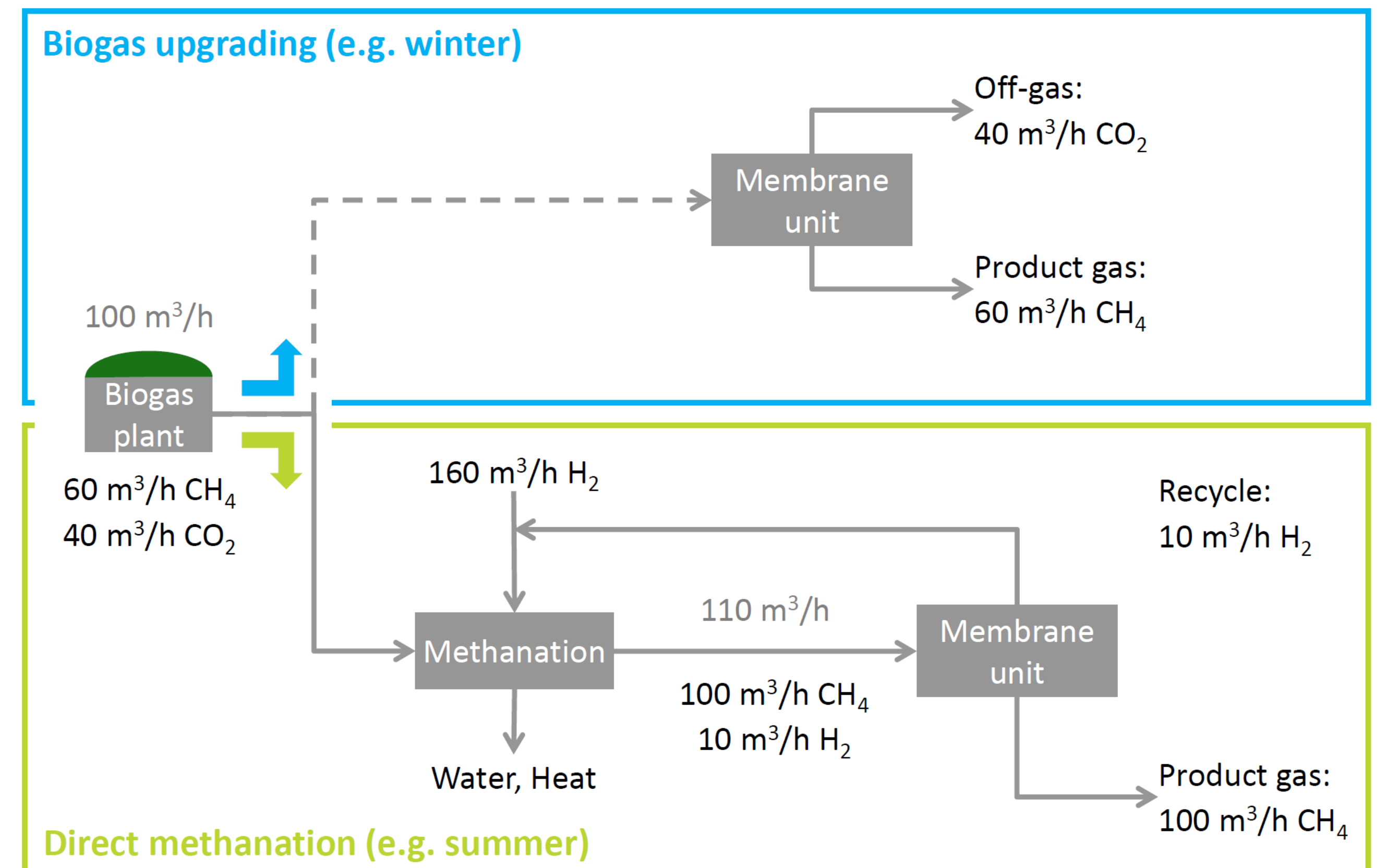
Flexible upgrading of biogas to reach grid specifications ( $> 96\% \text{CH}_4$ ,  $< 2\% \text{H}_2$ ) with Power-to-Gas (PtG), optimally without using expensive or too  $\text{CO}_2$ -loaden electricity for PtG

## CONCEPT

Membrane-based upgrading concept allows fast switching between biogas upgrading ( $\text{CO}_2$  removal) and PtG operation (incl.  $\text{H}_2$  recycle)

## METHODS

Systematic study: lab tests of gas cleaning/methanation, field tests at TRL 5 with real gas, pilot scale experiments to understand reactor hydrodynamics, and techno-economic analysis to obtain cost structure



## KEY RESULTS

Goal: Flexible upgrading of biogas to reach grid specifications ( $> 96\% \text{CH}_4$ ,  $< 2\% \text{H}_2$ ) with Power-to-Gas, optimally without using expensive or too  $\text{CO}_2$ -loaden electricity for PtG

- Renewable natural gas (biomethane) allows to store electricity (Power-to-gas) and biomass in the natural gas grid for later use in mobility or re-electrification with an efficiency close to 59% ( $\text{kWh}_{\text{el}}$  to  $\text{kWh}_{\text{HHV,CH}_4}$ )
- Fluidised bed methanation is robust and flexible (1000h test TRL 5)
- Pilot plant (TRL 6) allowed to obtain reliable hydrodynamic data to support up-scale, and will enable dynamic reactive experiments
- Synergistic combination of methanation and membrane is the key
- Swiss SMEs identified as partners to build demonstration plant (TRL 8) at a Swiss biogas plant



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