

# Surplus electricity to biogas via hydrogen

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## Aim and Objectives

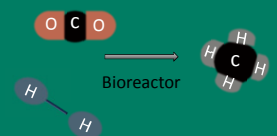
To develop a technical solution of converting surplus wind energy or other fluctuating source into a storable gas such as methane, CH<sub>4</sub>. The conversion of electricity to methane will be evaluated. By using the bio – Sabatier reaction H<sub>2</sub> and CO<sub>2</sub> can lead to CH<sub>4</sub> production. Lab scale reactors for this conversion will be implemented. The continuous operation of this configuration will result in an efficiency calculation. In addition, H<sub>2</sub> consumption from hydrogenotrophic archaea will be optimised.

## Task & methodology

### Task 1 Background research

- Possibilities of biological and chemical bio – Sabatier reaction
- Minimal chemicals and energy demand

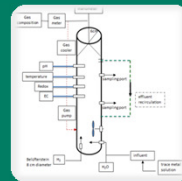
on going



### Task 2 Lab scale reactor design

- Continuous stirred reactor
- ~ 10 L working volume

on going



- plexiglas double jacket reactor
- possibility of recirculation streams
- parameters on line control

### Task 3 Operation and monitoring

- Continuous operation
- Batch tests

recently started



- continuous operation at 37° C
- operation without H<sub>2</sub> injection
- operation with H<sub>2</sub> injection



### Task 4 Efficiency analysis

- Calculation of efficiency
- Biogas yield

starting January 2015



*Evaluation of the systems' stability under different operational conditions*

### Task 5 Large – scale reactor

- Design of a full – scale reactor

starting November 2015

- scale up the optimal configuration
- energy and costs analysis

## Outcome

The expected outcome of this project is to implement an efficient process for converting the excessive renewable energy into CH<sub>4</sub>. This process will result in decreased biogas upgrading costs and the possible use of biogas as an alternative to natural gas. The main benefit will be the use of the existing infrastructure system for storing electricity.