

Overview

Basic idea: Production of renewable methane

Power-to-gas is a process where excess electric energy is used to produce hydrogen H_2 or methane CH_4 . As shown in Figure 1, the process consists of the electrolysis as a first step which transforms water H_2O into hydrogen. In a second step hydrogen H_2 is transformed to methane CH_4 by reducing CO_2 from biogas plants, industrial facilities (e.g. waste incineration plants, sewage treatment plants, concrete factories, breweries) or from the atmosphere.

Research

The proposed project focuses on the application side and has the goal to establish a deep inside on the entire value chain from the point of view of available and future technologies, possible business models as well as the geographical distribution of energy infrastructure (both gas and electricity), CO_2 -Sources and fleets (Figure 2). The project develops concepts for the realisation of RMTM and gives recommendations for action targeted towards potential investors in and operators of power-to-gas plants, towards players serving as CO_2 -source as well as fleet operators.

It is the first time such an analysis is conducted for Switzerland. This study can be the last brick which closes the gap between the outputs from technology developments and pilot plants on one side and the commercialisation of power-to-gas under the right political preconditions and incentives on the other side.

During the first two years, the project will concentrate on a first Focus Region around the city of St.Gallen, where the two industrial partners sgsw as co-applicant and Migros as partner can provide information on their infrastructure and fleet. Since information on chemistry, biological processes, plant technologies, economical aspects, legal aspects and application requirements are closely.

Being a Swiss Competence Center for Energy Research, HSR has built a demonstration plant to show and investigate the process from power to methane (Figure 3).

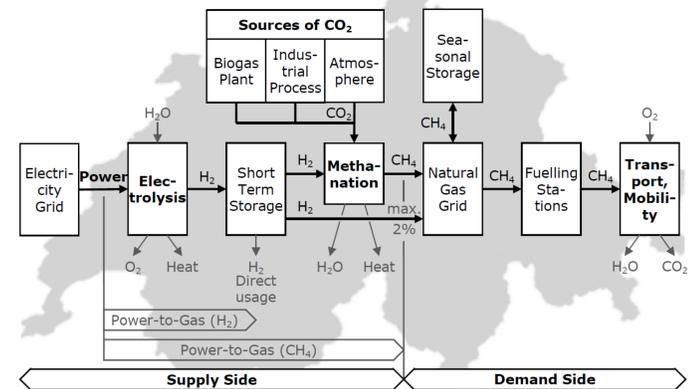


Figure 1: The value chain in the system "Renewable Methane for Transport and Mobility".

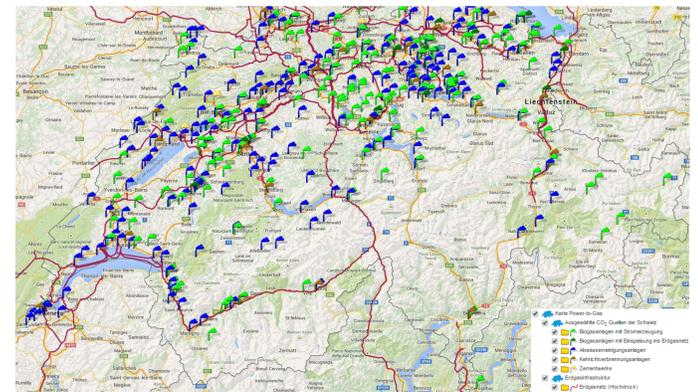


Figure 2: Map of sources of concentrated CO_2 in Switzerland.



Figure 3: Demonstration plant for production of renewable methane in Rapperswil.

Partners and Collaboration



- Energy supply company of focus region.
- Provides data of interest.



- Overview on system economy: Identify and describe players in the value chain.



- Analysis of available technologies for electrolysis and catalytic methanation.

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- Technology screening and evaluation of biomethanation concepts.

Energy Turnaround

- ✓ Power-to-gas is the only method to store large amounts of electricity from seasons with excessive renewable power to seasons with less renewable power (e.g. from summer to winter) in an existing infrastructure (Figure 4).
- ✓ Power-to-gas currently is the only possibility to ensure renewable energy supply in transport and mobility, where long distances and short refilling times are required, especially in commercial traffic
- ✓ Sources of carbon dioxide CO_2 (e.g. waste incineration plants) can be used as a resource for methanation. Making use of all Swiss waste incineration plants as CO_2 -source would reduce Switzerland's output of CO_2 by 5 %.

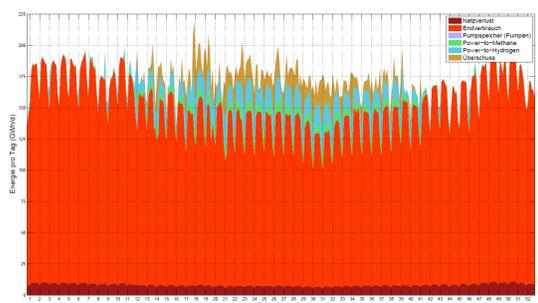


Figure 4: Modell of future energy supply and consumption in Switzerland. Excess energy is stored as gas. Model provided by SCS AG.

Contact

HSR Hochschule für Technik Rapperswil
IET Institut für Energietechnik
Prof. Dr. Markus Friedl | markus.friedl@hsr.ch
Oberseestrasse 10 | CH-8640 Rapperswil

