IEA Bioenergy
Technology Collaboration Programme

IEA Bioenergy Task 37 «Energy from Biogas» – Ergebnisse und Erkenntnisse

Bernhard Drosg (internationaler Task Leader)

20.5.2025

Task 37 Energy from Biogas -
17 Teilnehmerländer im Triennium 2025-2027

- Austria
- Australia
- Brasil
- Canada
- Denmark
- European Commission
- Finland
- France
- Germany
- India
- Ireland
- Italy
- Netherlands
- Norway
- Sweden
- Switzerland
- UK

Erstes Task Meeting (Triennium 2025-2027)

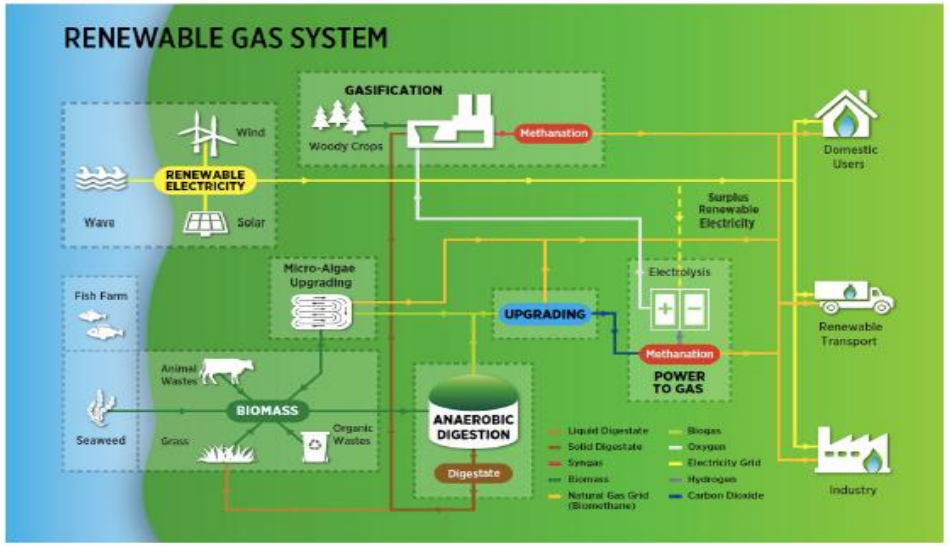
Oslo, Norwegen

Study Tour visit
VEAS Biogasanlage
(Abwasser-
reinigung Oslo)

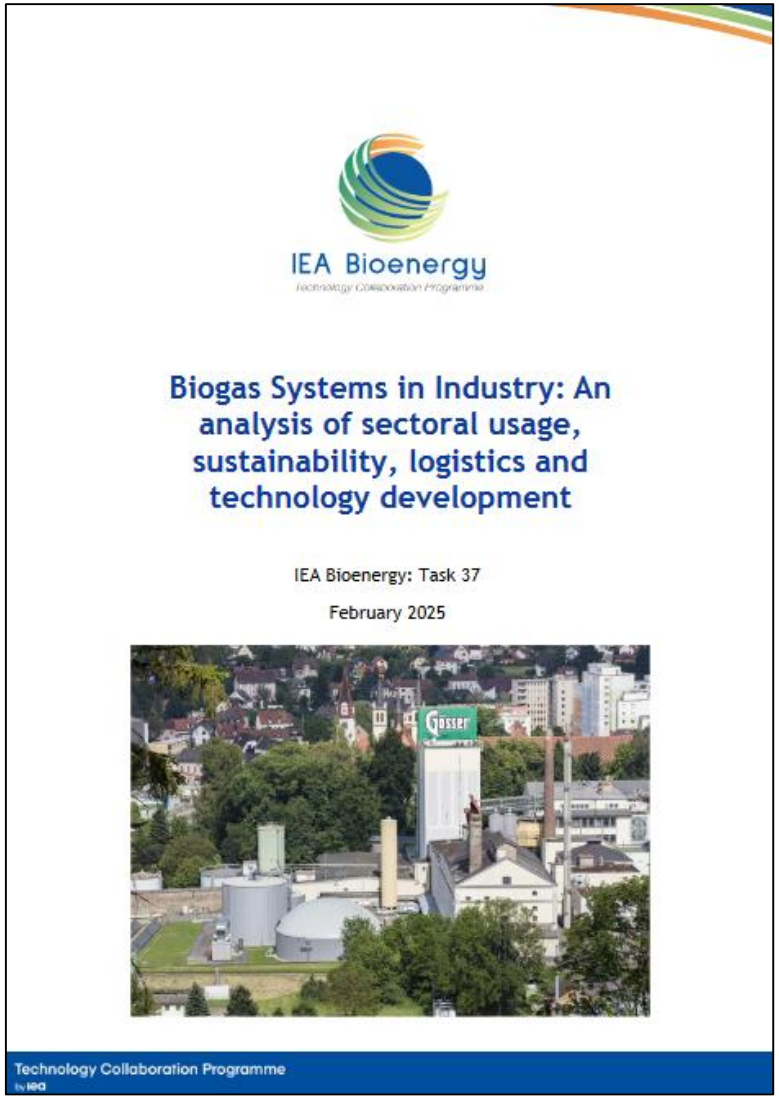
März 24-28, 2025

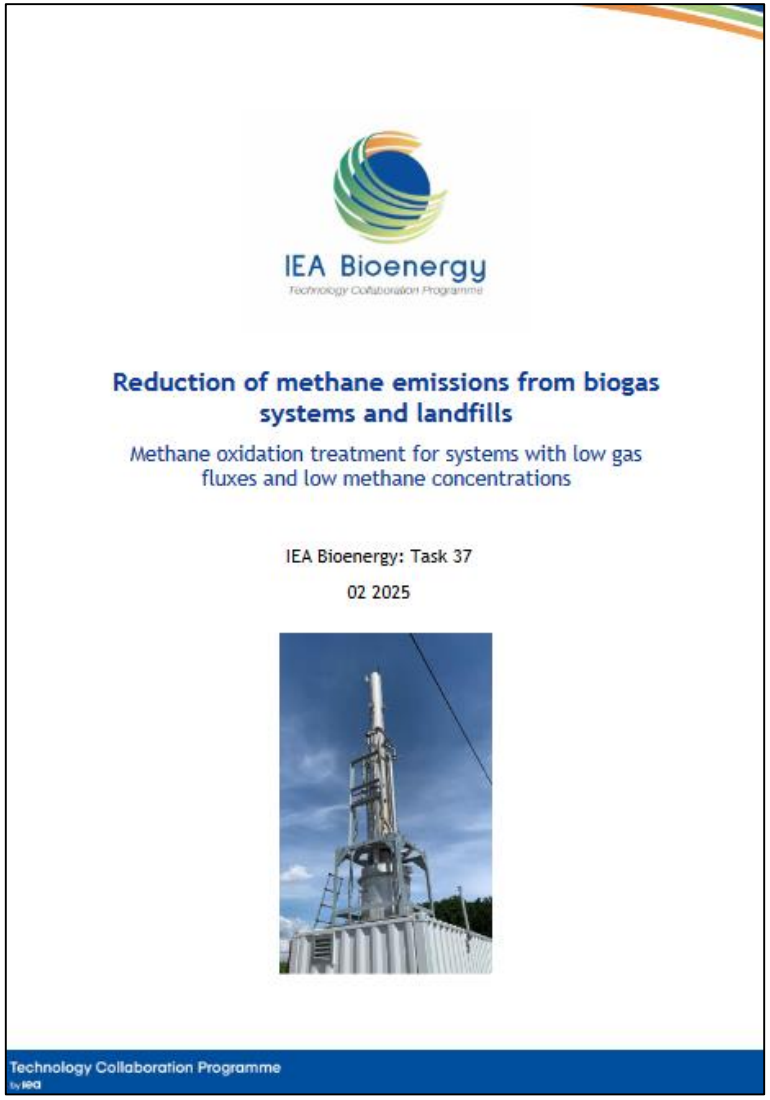
Work Programme 2022-2024 - abgeschlossen

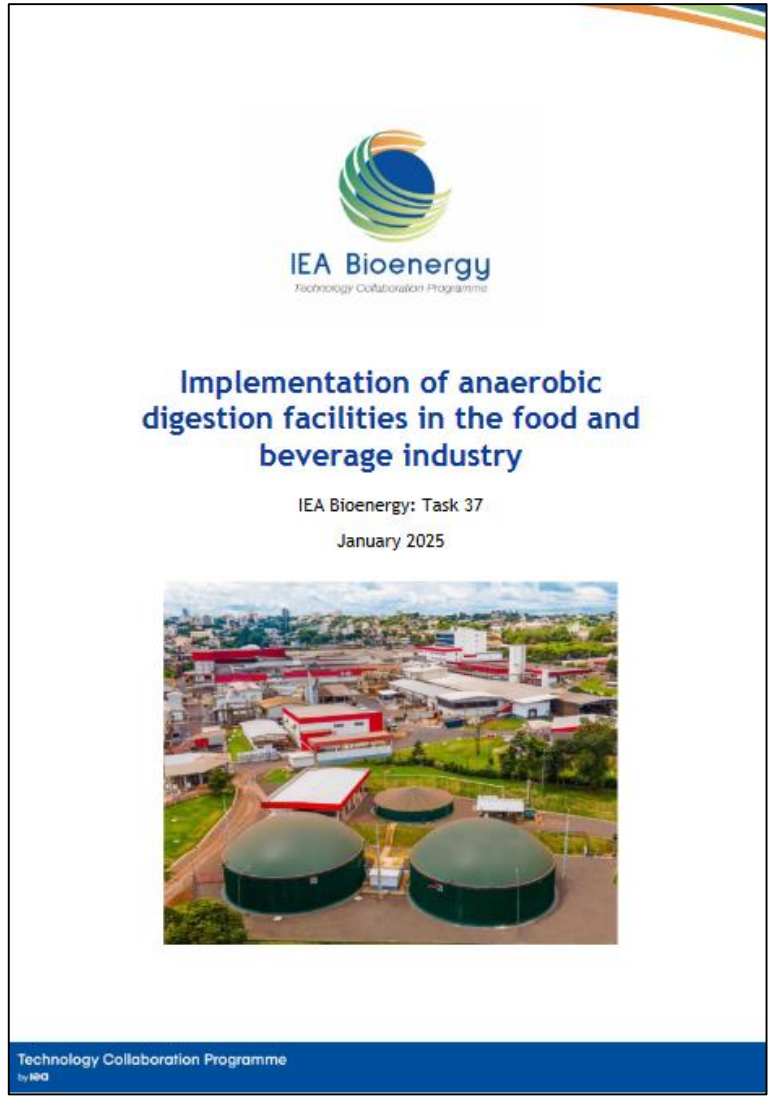
- Bewertung des Zusatznutzens von Biogas in einem Kreislaufwirtschaftssystem
- Detaillierte Bewertung einer optimierten Nutzung von Gülle
- Dekarbonisierung der Lebensmittel- und Getränkeindustrie
- Energie- und Transportkraftstoffe aus erneuerbaren Gasen
- Verringerung des Methanschlupfs bei Biogasanlagen und Deponien
- Case Stories (2-4 Seiten)
- Country Report Summaries
- Intertask: Synergien bei der Nutzung von grünem Wasserstoff und biobasierten Wertschöpfungsketten
- Newsletter



Task 37 Energy from Biogas -Technische Reports







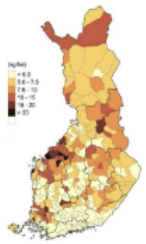
Task 37 Energy from Biogas -Technische Reports

IEA Bioenergy
Technology Collaboration Programme

Potential for Manure-based Anaerobic Digestion - Motivations, Barriers and Approaches in Six Countries

IEA Bioenergy: Task 37

March 2025



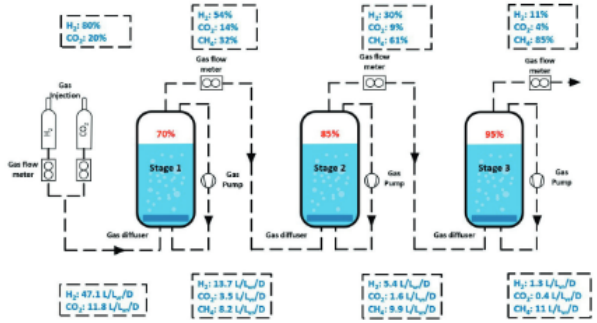
Technology Collaboration Programme
by IEA

IEA Bioenergy
Technology Collaboration Programme

Circular economy approaches to integration of anaerobic digestion with Power to X technologies

IEA Bioenergy: Task 37

January 2024



Technology Collaboration Programme
by IEA

IEA Bioenergy
Technology Collaboration Programme

The role of biogas and biomethane in pathway to net zero

Position paper

IEA Bioenergy Task 37: 12 2022

The role of biogas and biomethane in pathway to net zero

Biogas is produced as the main product of anaerobic digestion (AD) of wet biomass. Biogas can be used locally for heat purposes or for power and heat production (CHP); as an alternative, biogas can be upgraded to bio-methane to replace natural gas. As such, it is one of the means to reduce the consumption of fossil fuels and contribute to the transition towards a net zero energy system.

This position paper - developed by members of IEA Bioenergy Task 37 ("Energy from Biogas") - provides a holistic perspective on the roles of biogas and biomethane. The main conclusion is that biogas and biomethane have a range of options which can be employed in pathways to net zero. They provide sustainable flexible systems that play essential roles in circular economy, energy, and environmental systems.

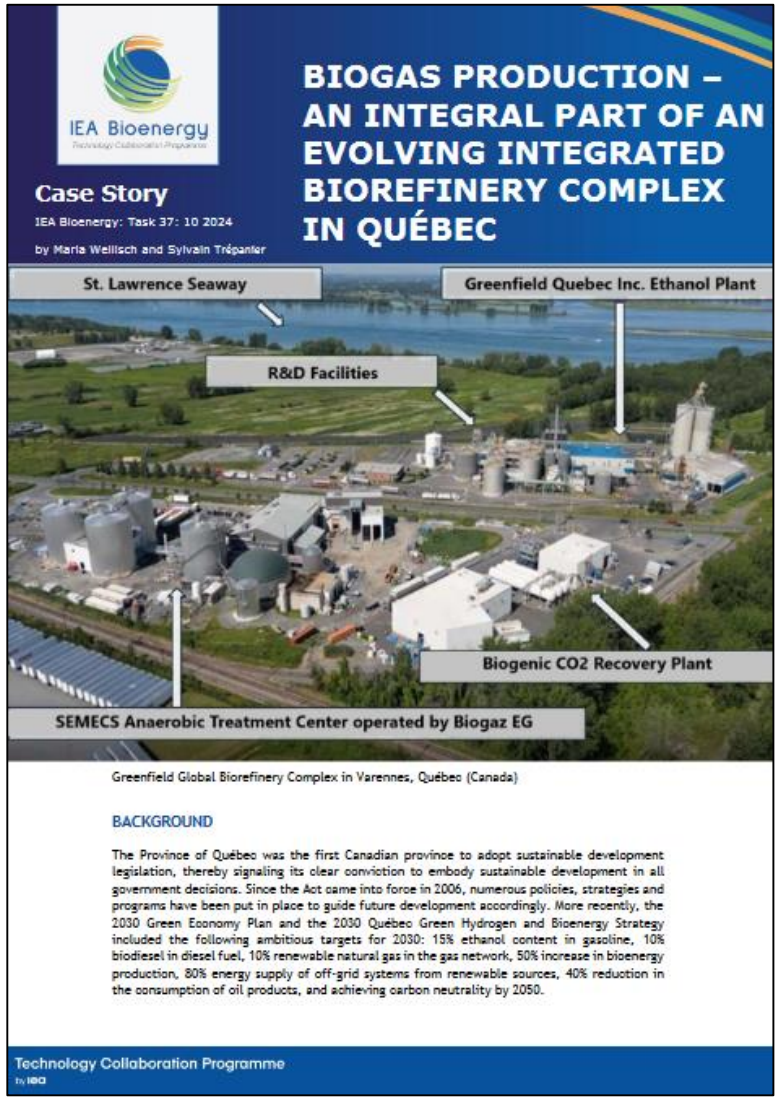
PERSPECTIVES OF BIOGAS AND BIOMETHANE

Pathway to Net Zero

The pathway to net zero requires far more than provision of renewable electricity. We must employ renewable hydrocarbons in the form of liquid and gaseous fuels with minimum carbon intensity. Indeed, we must go beyond energy and employ renewable green hydrogen in the production of chemicals such as ammonia (NH_3) and methanol (CH_3OH), and for steel. When we produce biomethane (CH_4) or green hydrogen (H_2), we are in both cases producing renewable hydrogen molecules within a renewable gas. We need these renewable gases and renewable hydrocarbons for dispatchable electricity, for long term energy storage and for sectors where electricity has limited applications. These applications (termed the hard to abate sectors) include: heavy-duty, long-distance transport (trucks, ships and planes); high temperature industrial heat (food and beverage sector, steel production, glass production); agriculture (renewable fertiliser such as green ammonia and biofertiliser); and chemical production (such as methanol).

Technology Collaboration Programme
by IEA

Task 37 Energy from Biogas - Case Stories



IEA Bioenergy

BIOGAS PRODUCTION – AN INTEGRAL PART OF AN EVOLVING INTEGRATED BIOREFINERY COMPLEX IN QUÉBEC

Case Story

IEA Bioenergy: Task 37: 10 2024

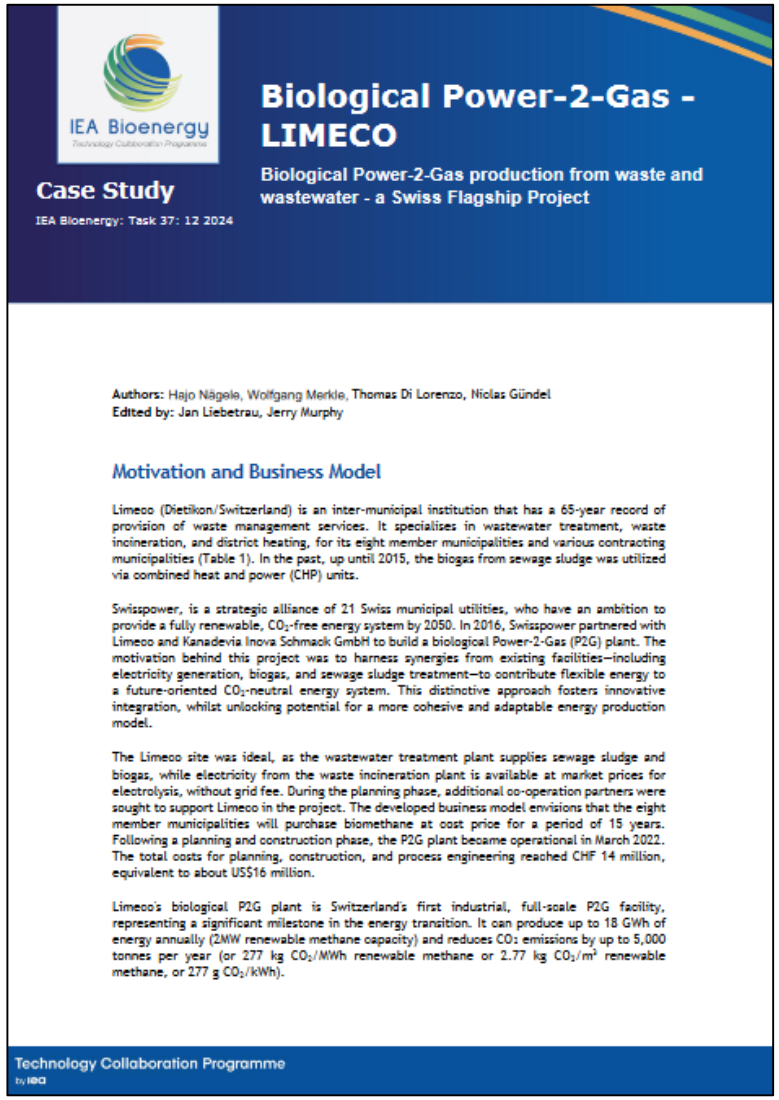
by Maria Wellisch and Sylvain Trépanier

Greenfield Global Biorefinery Complex in Varennes, Québec (Canada)

BACKGROUND

The Province of Québec was the first Canadian province to adopt sustainable development legislation, thereby signaling its clear conviction to embody sustainable development in all government decisions. Since the Act came into force in 2006, numerous policies, strategies and programs have been put in place to guide future development accordingly. More recently, the 2030 Green Economy Plan and the 2030 Québec Green Hydrogen and Bioenergy Strategy included the following ambitious targets for 2030: 15% ethanol content in gasoline, 10% biodiesel in diesel fuel, 10% renewable natural gas in the gas network, 50% increase in bioenergy production, 80% energy supply of off-grid systems from renewable sources, 40% reduction in the consumption of oil products, and achieving carbon neutrality by 2050.

Technology Collaboration Programme



IEA Bioenergy

Biological Power-2-Gas - LIMECO

Biological Power-2-Gas production from waste and wastewater - a Swiss Flagship Project

Case Study

IEA Bioenergy: Task 37: 12 2024

Authors: Hajo Nägele, Wolfgang Merkle, Thomas Di Lorenzo, Niclas Gündel
Edited by: Jan Liebetrau, Jerry Murphy

Motivation and Business Model

Limeco (Dietikon/Switzerland) is an inter-municipal institution that has a 65-year record of provision of waste management services. It specialises in wastewater treatment, waste incineration, and district heating, for its eight member municipalities and various contracting municipalities (Table 1). In the past, up until 2015, the biogas from sewage sludge was utilized via combined heat and power (CHP) units.

Swisspower, is a strategic alliance of 21 Swiss municipal utilities, who have an ambition to provide a fully renewable, CO_2-free energy system by 2050. In 2016, Swisspower partnered with Limeco and Kanadevia Inova Schmack GmbH to build a biological Power-2-Gas (P2G) plant. The motivation behind this project was to harness synergies from existing facilities—including electricity generation, biogas, and sewage sludge treatment—to contribute flexible energy to a future-oriented CO_2-neutral energy system. This distinctive approach fosters innovative integration, whilst unlocking potential for a more cohesive and adaptable energy production model.

The Limeco site was ideal, as the wastewater treatment plant supplies sewage sludge and biogas, while electricity from the waste incineration plant is available at market prices for electrolysis, without grid fee. During the planning phase, additional co-operation partners were sought to support Limeco in the project. The developed business model envisions that the eight member municipalities will purchase biomethane at cost price for a period of 15 years. Following a planning and construction phase, the P2G plant became operational in March 2022. The total costs for planning, construction, and process engineering reached CHF 14 million, equivalent to about US$16 million.

Limeco's biological P2G plant is Switzerland's first industrial, full-scale P2G facility, representing a significant milestone in the energy transition. It can produce up to 18 GWh of energy annually (2MW renewable methane capacity) and reduces CO_2 emissions by up to 5,000 tonnes per year (or 277 kg CO_2/MWh renewable methane or 2.77 kg CO_2/m^3 renewable methane, or 277 g CO_2/kWh).

Technology Collaboration Programme

Task 37 Energy from Biogas - Case Stories

IEA Bioenergy

Case Story

IEA Bioenergy: Task 37: 09 2024

Renewable CO_2 from food waste based Biogas – a case story from Switzerland

Authors: Jan Liebetrau (Rytec GmbH),
Phillipe Lehman (CO_2 Energie AG), Dominic Signer (CO_2 Energie AG)

Background an Overview

Food waste is a perfect feedstock for biomethane production. Every day, the Recycling Energie AG in Nesselnbach, Switzerland processes 300 tons of food waste from restaurants, hospitals and residential facilities and turns this into biogas. App. 800 m³/h of the raw biogas is then upgraded and fed as natural gas substitute into the gas grid. The annually injected biomethane equals an energy equivalent of 35 GWh/a.

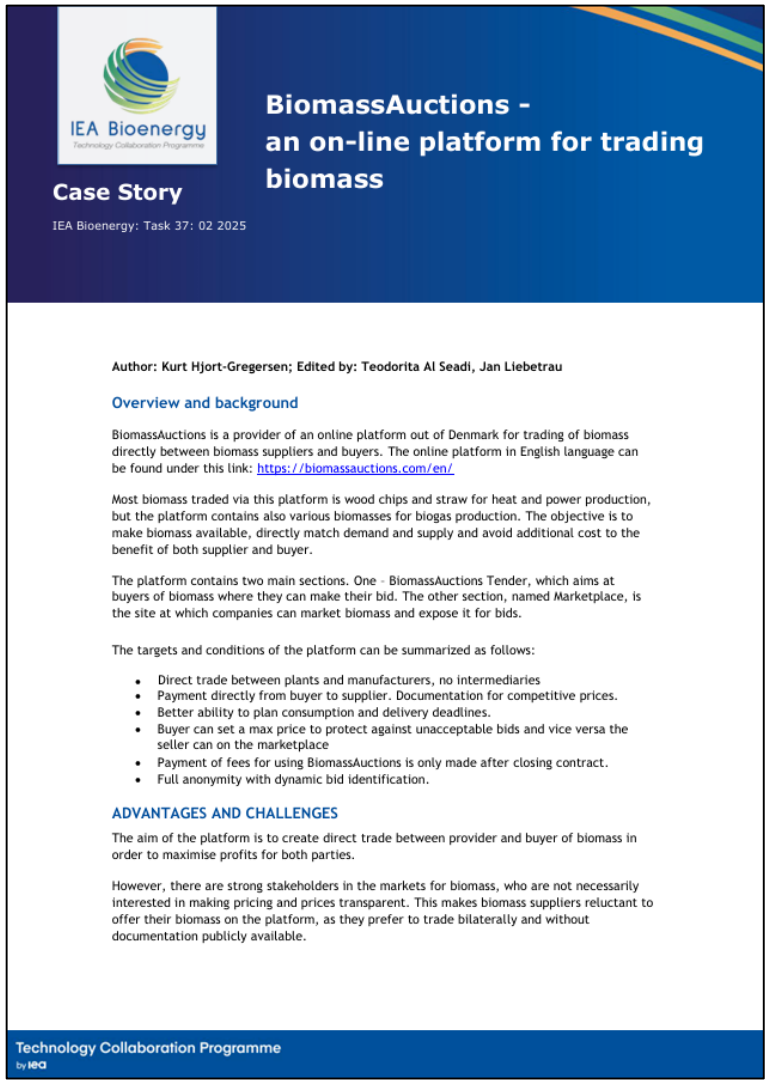
The upgrading of the biogas produces an offgas, which contains mainly the renewable CO_2 and a residual proportion of methane, the so called methane slip. In general such waste gas streams are - depending on valid regulation - either combusted to reduce methane emissions or they are discharged into the environment. Since March 2023 in Nesselnbach the offgas is treated further to turn the CO_2 into a commercial product. The CO_2 cleaning and liquefaction plant is one of only a few plants in Europe to provide biogenic CO_2 in a food grade quality. CO_2 is an important base product for the chemical and food industries. Large quantities of biogenic and therefore renewable and emission neutral CO_2 are needed to substitute fossil CO_2 which is currently the standard within the industries. Beside such applications, so called carbon capture and utilization (CCU) there might be an increasing market for carbon capture and storage (CCS) technologies, where the CO_2 is stored underground.

The CO_2 upgrading and liquification plant is operated by an separate company, the CO_2 Energie AG. The liquefaction plant produces up to 4000 tons of food-grade liquid CO_2 per year. Industrial gases company Messer Schweiz AG collects the CO_2 three times a week by a tanker and sells it to manufacturers - for example producers of dry ice or carbonated drinks. CO_2 Energie AG generates further income for the operation of the plant through the sale of CO_2 compensation certificates, which is done via the Swiss climate protection foundation Klik. The sale of certificates is an essential aspect - the revenue from selling the CO_2 alone is not sufficient to cover production costs.

The technical process

The biogas treatment plant feeds the CO2 filtered out of the raw gas into the new liquefaction plant (see Figure 1). There it is cleaned, filtered and dehydrated. In the following step it is cooled down to around minus 20 degrees Celsius, where it liquefies.

Technology Collaboration Programme
by iea



IEA Bioenergy

Case Story

IEA Bioenergy: Task 37: 02 2025

BiomassAuctions - an on-line platform for trading biomass

Author: Kurt Hjort-Gregersen; Edited by: Teodorita Al Seadi, Jan Liebetrau

Overview and background

BiomassAuctions is a provider of an online platform out of Denmark for trading of biomass directly between biomass suppliers and buyers. The online platform in English language can be found under this link: https://biomassauctions.com/en/

Most biomass traded via this platform is wood chips and straw for heat and power production, but the platform contains also various biomasses for biogas production. The objective is to make biomass available, directly match demand and supply and avoid additional cost to the benefit of both supplier and buyer.

The platform contains two main sections. One - BiomassAuctions Tender, which aims at buyers of biomass where they can make their bid. The other section, named Marketplace, is the site at which companies can market biomass and expose it for bids.

The targets and conditions of the platform can be summarized as follows:

- Direct trade between plants and manufacturers, no intermediaries
- Payment directly from buyer to supplier. Documentation for competitive prices.
- Better ability to plan consumption and delivery deadlines.
- Buyer can set a max price to protect against unacceptable bids and vice versa the seller can on the marketplace
- Payment of fees for using BiomassAuctions is only made after closing contract.
- Full anonymity with dynamic bid identification.

ADVANTAGES AND CHALLENGES

The aim of the platform is to create direct trade between provider and buyer of biomass in order to maximise profits for both parties.

However, there are strong stakeholders in the markets for biomass, who are not necessarily interested in making pricing and prices transparent. This makes biomass suppliers reluctant to offer their biomass on the platform, as they prefer to trade bilaterally and without documentation publicly available.

Technology Collaboration Programme
by iea

Neues Work Programme -2025-2027

- Nachhaltigkeit - Bewertung des Zusatznutzens von Biogas in einem Kreislaufwirtschaftssystem
- Anwendung von Gärresten in der landwirtschaftlichen Produktion
- Molekularbiologisches Monitoring von Mikroorganismenkulturen in Biogasanlagen
- Biogassysteme und Synergien mit der Produktion von „e-Fuels“
- Ökonomie und Grenzkosten der Treibhausgasvermeidung
- Kleine Biogassysteme – Home Biogas Systems
- Case stories (2-4 Seiten)
- Country Report Summary
- Intertask: BECCUS, Synergies
- Newsletter und Webinare

Wo finde ich Task 37 und die Task-Publikationen?

Homepage - https://task37.ieabioenergy.com/

Newsletter - https://task37.ieabioenergy.com/newsletters/

Webinare und Workshops - https://task37.ieabioenergy.com/events/

LinkeIn Account - https://www.linkedin.com/showcase/task-37-energy-from-biogas/posts/?feedView=all

Download von Veröffentlichungen:

- Technischer Report - https://task37.ieabioenergy.com/technical-reports/
- Country Report Summaries - https://task37.ieabioenergy.com/country-reports/
- Case Stories - https://task37.ieabioenergy.com/case-success-stories/

Vielen Dank für Ihre Aufmerksamkeit!

Dipl.-Ing. Dr. Bernhard Drosg
Universität für Bodenkultur Wien,
Department für Agrarwisssenschaften,
Institut für Umweltbiotechnologie
bernhard.drosg@boku.ac.at

IEA Bioenergy
Technology Collaboration Programme

www.ieabioenergy.com