Extract from the topic report
Energy for the Future,

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BIOSWEET

BIOmass for SWiss EnErgy fuTure

biosweet
Swiss Competence Center for Energy Research

Leading house
Paul Scherrer Institute (PSI)

Head
Prof. Oliver Kröcher,
PSI, Laboratory for Bioenergy and Catalysis

Deputy head
Prof. Frédéric Vogel,
University of Applied Sciences and Arts Northwestern Switzerland (FHNW)

Contact / Managing director
Dr Simone Nanzer
simone.nanzer@psi.ch
+41 (0)56 310 41 55
www.sccer-biosweet.ch

The SCCER's activities

The BIOSWEET SCCER shares the vision of the Swiss government's energy policy, that in 2050 energy from biomass will make up twice as much of the energy mix as it does today, namely 100 petajoules. If this target is to be reached, the use of biomass must be gradually increased; to achieve this, the SCCER is optimising existing technologies, developing new ones and trying to bring them to market maturity.

Biomass is a very versatile source of energy. It can be used to produce electricity and heat, as well as liquid, solid or gas fuels. Furthermore, it can also be stored, unlike other renewables.

The SCCER conducts systemic research based on idealistic assumptions, asking what the best possible use of biomass might be. How can we generate the maximum amount of energy? How can we achieve the highest possible reductions in CO_2? At the moment it is not clear whether people will one day be prepared to pay a premium for this kind of energy – bioenergy is often more expensive than other types – or which of these energy services will be in demand in future.

For this reason, the SCCER conducts fairly wide-ranging research and concentrates on technologies that could be suitable for the market in 10 or 15 years at the latest. For each technology it works with a partner from industry. The minimum requirement is for researchers to have a clear idea of how to attract an industry partner, even if the technology they are working on is at a very early development stage. They must have already filed a patent application and have a master plan for launching the technology on the market. The SCCER actively publicises its research results and is one of the few SCCERs to have already employed a knowledge and technology transfer officer in the first funding period.

Research is centred on the supply side. It focuses on increasing the efficiency of conversion technologies (generating bioenergy from biomass and biofuels), better integration of the various energy systems and innovative value-added chains. Demonstrators such as the Energy Systems Integration (ESI) trials platform are also employed. On the demand side, the SCCER conducts research into replacing fossil fuels with biomass in order to generate heat and electricity and for transport use. Finally, researchers are involved in developing models of optimum biomass value-added chains as a basis for policy decisions.

BIOSWEET SCCER model projects

INDUSTRIAL WOOD DUST BURNER

Producing asphalt with CO_2-neutral biomass

Asphalt is produced by drying and heating aggregate and then mixing it with bitumen. The aggregate is dried in rotary tumblers heated by the exhaust generated from burning fossil fuels. The aim of this project is to use CO_2-neutral biomass as the fuel in the drying process, such as wood dust or other plant material, which produces few pollutants when burnt. The new burner is being developed using experimental methods and fuel analyses, and numerical calculations of the gas flow and reaction processes.

Partners: FHNW, Ammann AG; Co-funder: CTI

TORPLANT

Refining biomass by drying

Wet and smelly biomass cannot be used to produce energy, but in the torrefaction process it can be turned into a useable and storable product. Laboratory trials and then a pilot installation have shown that the energy density of dried biomass pellets is a third higher than that of conventional wood pellets. This reduces transport and storage costs. Waste heat can also be recovered from the process, so a plant that produces 500kg of pellets per hour can be run profitably under current economic conditions.

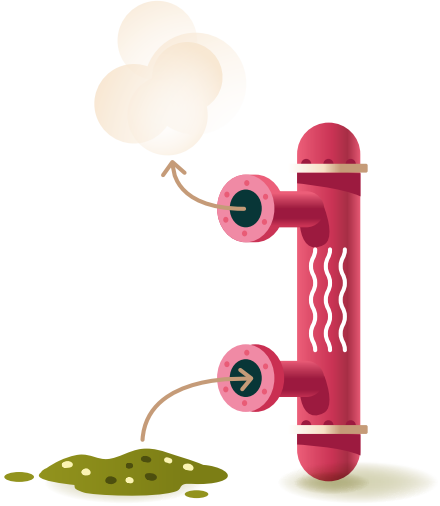
Partners: HEIG-VD, GRT Technology Group, Ökozentrum;
Co-funder: Canton of Vaud

SALT SEPARATOR

Salt separator for gasifying biomass

The PSI has developed an efficient process for producing a methane-rich gas from damp biomass. In a pilot, a salt separator prototype was developed, constructed and integrated into an existing plant at the Karlsruhe Institute of Technology (KIT). A trial conducted under realistic conditions with glycerine and fermentation residue from a biogas plant produced a methane-rich gas with stable results, in large part thanks to the prototype. Based on the positive results from this project, a large-scale industrial model is planned at the PSI.

Partners: KIT, PSI, FHNW, Kasag AG; Co-funder: SFOE



Facts and figures

No 2 in Switzerland

Biomass is the second most important source of renewable energy produced in Switzerland.

5 energy types

Biomass is the most versatile of the renewable energy sources, providing five different energy services: heat, electricity, solid fuel, liquid fuel and gas.

55 partners

The nine research partners cooperate with 55 private and public organisations: 8 large corporations, 38 SMEs and 9 public institutions or associations.

45% unexploited potential

Only 55 per cent of domestic biomass substrate is currently used to produce bioenergy; there is, therefore, considerable potential to exploit.

32 petajoules

The greatest unused potential for producing bioenergy lies in farmyard waste and timber. These materials could provide 32 petajoules of primary energy.

How the BIOSWEET SCCER contributes to the 2050 Energy Strategy

Under the 2050 Energy Strategy, 100 petajoules of energy will be produced using biomass by the year 2050. This is double the amount currently consumed.

➜ The SCCER has recorded and analysed the potential of all biomass substrates in Switzerland. It gathered data from 600 stakeholders and compared the findings with existing studies, and concluded that the 100-petajoule target is realistic.

➜ The SCCER optimises and researches conversion technologies with the aim of making better use of biomass substrate. It develops regional value-added chains and small-scale plants for sources which are not yet exploited since only small amounts of biomass are available.

➜ The SCCER also develops business models with biomass and optimises the logistic processes and pre-treatment methods involved. Interfaces are important here: which requirements does a plant need to meet in order to process biomass of a certain quality?

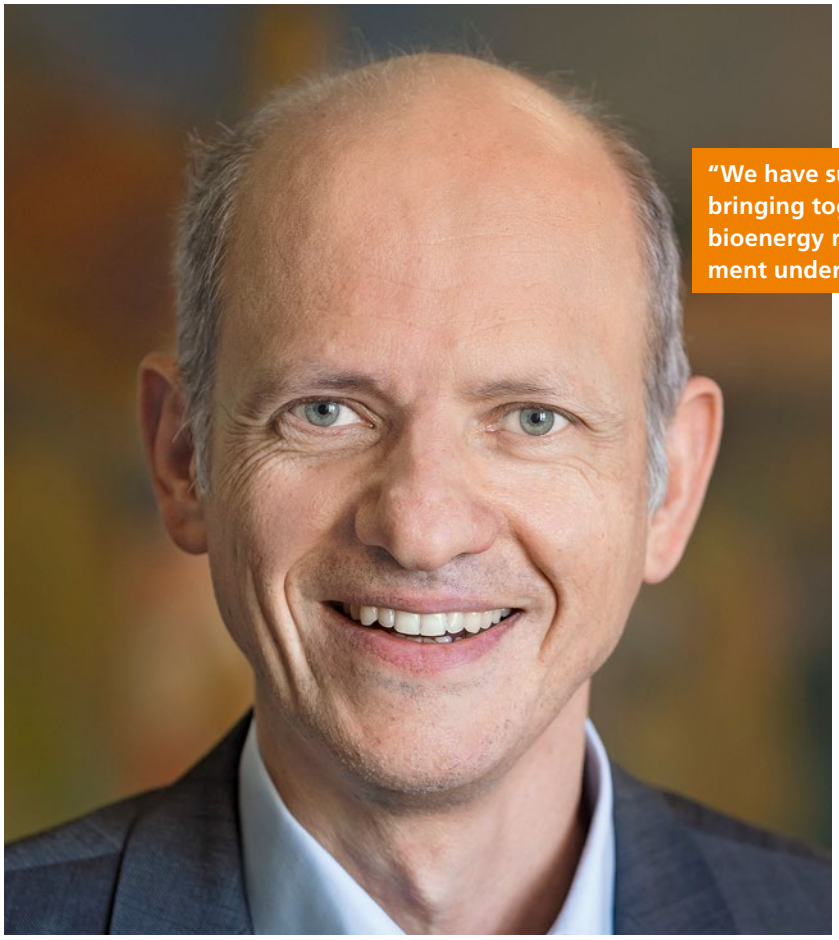
➜ The SCCER creates prototype plants to test existing or new technologies. On the ESI (Energy System Integration) experimental platform, for example, BIOSWEET and the HaE SCCER combine existing technologies that have not been successful in isolation, resulting in biomass and storage solutions that are potentially of use to the industry.

Participating institutions

- PSI Paul Scherrer Institute (leading house)
- BFH Bern University of Applied Sciences
- EPFL Federal Institute of Technology Lausanne
- ETHZ Federal Institute of Technology Zurich
- FHNW University of Applied Sciences and Arts Northerwestern Switzerland
- HES-SO University of Applied Sciences and Arts in Western Switzerland
- SUPSI University of Applied Sciences and Arts of Southern Switzerland
- WSL Swiss Federal Institute for Forest, Snow and Landscape Research
- ZHAW Zurich University of Applied Sciences

You'll find our innovation roadmap and further information here

➜ www.sccer-biosweet.ch



"We have succeeded in bringing together the bioenergy research environment under one roof."

What do you find fascinating about energy?

As a human being living on this planet, I use energy and am myself part of the problem. Through my work as a researcher I can contribute to solving the problem. And what is more, I owe this to my three children.

Which of your SCCER's successes are you particularly proud of?

We have succeeded in bringing together the bioenergy research environment under one roof; it used to be fragmented but is now more united.

What is your personal motivation in heading the SCCER?

I can increase my visibility as a researcher and have a greater influence; my voice is heard more clearly. This is motivating and makes the job attractive.

Prof. Oliver Kröcher,
PSI, Laboratory for Bioenergy and Catalysis

Oliver Kröcher obtained a degree in chemistry from the University of Würzburg in 1993. From 1994 he worked as an assistant at the Laboratory of Organic Chemistry at the ETHZ, obtaining a PhD in 1997. From 1997 to 2001 he worked at Degussa researching catalytic processes and towards the end of his time there headed the research group. In 2001 he moved to the PSI, where he took on responsibility for the Catalysis for Energy Processes group. Oliver Kröcher has also been head of the Laboratory for Bioenergy and Catalysis (LBK) at the PSI since 2011, and a member of the board at Hydromethan AG, a PSI spin-off. He has been a professor at the EPFL since 2013.