Energy
National Research Programmes 70 and 71

Project

Multi-energy hub systems and society

Sharing solar electricity with neighbours

Sharing solar electricity with neighbours

Mixing, storing and sharing different renewable energy output with neighbours – according to a study, this is viewed positively by the population. It remains unclear who might be willing to implement and pay for decentralised multi-energy systems of this nature.

The concept of sharing renewable energy with neighbours is popular amongst the Swiss. *Source:* Shutterstock

At a glance

- So-called multi-energy-hub systems (MES) supply entire districts with electricity and heat.
- MES are well-received by the public, as a study published by ETH Zurich shows.
- However, the question of costs impedes the willingness to implement such systems.

Cooking with solar power, showering with geothermal energy – and whatever energy is not being used is stored in batteries for later, or simply flows to a neighbour. So-called multi-energy-hub systems (MES) make it possible to supply entire districts with renewable energy – instead of individual buildings.

Depending on what energy sources are available locally, multi-energy systems can be constituted differently: whether wind power, photovoltaics or heat pumps with batteries as energy storage. Another component is electrolysis units, which convert excess wind or solar power into a fuel gas such as hydrogen. Fuel cells can then use this to produce electricity and heat when the sun is not shining or the wind is not blowing. This process is also called power-to-gas technology. Further sub-modules of a multi-energy system are natural gas-fired combined heat and power plants – plants that use their fuel twice by generating heat and electricity simultaneously.

Acceptance important driver

Decentralised multi-energy-hub systems were tested within the context of the ETH joint research project "Integration of sustainable multi-energy-hub systems at neighbourhood scale" (IMES). Relevant criteria were their technical, economic and social feasibility. MES models have already been put into operation as part of a case study in two Swiss districts in Zernez and Zurich-Altstetten. These have shown that, from a technological perspective, MES can save substantial amounts of energy.

Their technical potential is one thing. Acceptance is something else altogether. MES systems are still at an early stage in their development. Correspondingly little is known about how they are accepted by society at large. This was examined as part of the "IMES-SE" sub-project by the two environmental systems scientists Pius Krütli and Roman Seidl from ETH Zurich. Specifically, they were keen to learn how MES are viewed by the population, and what challenges are likely to arise. The researchers see acceptance as an important driver if the new technology is to be used successfully. The team took Switzerland, Germany and Austria into account in its study. Drawing upon this data, the researchers ascertained social opportunities and challenges relevant to Switzerland.

After researching specialist literature on MES, interviews were conducted with city and utility managers as well as with experts who already deploy MES systems. This was followed by surveys on acceptance readiness, workshops at Empa Dübendorf and a spatial analysis in the city of Zurich.

Positive attitudes towards MES

The surveys identified generally positive sentiment and potential acceptance of MES. Study participants – landlords and tenants as well as experts – cited ownership concepts, funding, responsibility for implementation and security of supply as potential problems.

In all three countries, respondents named public authorities as being responsible for commissioning such systems. They also identified major energy suppliers as being important players, with responsibility for funding, infrastructure and control. According to the survey, cooperatives and individual households played a subordinate role.

Krütli and Seidl do not believe, however, that simply providing information about the MES concept will be sufficient to reach a well-founded opinion. Practical examples and more in-depth information are just as important. For this reason, they made the multi-energy system in the NEST building at Empa in Dübendorf a tangible experience. NEST stands for “Next Evolution in Sustainable Building Technologies” and is a modular research and innovation building created by the Swiss Laboratories for Materials Science and Research ("Empa") and the Water Research Institute ("Eawag"). The test building is used to test new technologies, materials and systems under realistic conditions.

Funding is the crux

Tenants and property owners attended the NEST guided tour as part of the study. This too revealed general acceptance towards the multi-energy-hub concept. As far as funding was concerned, however, the property owners were more sceptical than the tenants. In both cases, though, the willingness to pay more for renewable energies was rather low. MES installation and operating costs are currently two to three times higher than those of conventional systems.

Finally, the researchers ascertained the potential of MES for the city of Zurich. This showed that District 12 would be best suited to implementation. There are a comparatively large number of building cooperatives there, with a low density of different owners, which proved to be ideal for implementation.

Produkte aus diesem Projekt

- Distributed energy systems on a neighborhood scale: Reviewing drivers of and barriers to social acceptance
  Date of publication: 19.06.19
- Distributed energy systems: technology ready – acceptance pending
  Date of publication: 19.06.19
- Multi-Energy-Hubs in Quartieren
  Date of publication: 19.06.19

Contact & Team

Dr. Pius Krütli
Dep. Umweltsystemwissenschaften
CHN K 78
Universitätstrasse 16
8092 Zürich
Schweiz

+41 44 632 63 24
+41 44 632 10 29
pius.kruetli@usys.ethz.ch

Pius Krütli
Project direction

Roman Seidl

Timo von Wirth

All information provided on these pages corresponds to the status of knowledge as of 14.06.2019.