

## Forschung

### Applied Research

Our degree program has a strong focus on applied engineering. Students can gain practical experience and test new theories by becoming part of one of the several groups at Offenburg performing research on energy topics. Besides, Southwest Germany is famous for energy research. Offenburg University continues to pursue its own research, but collaborative activities with institutions like Fraunhofer ISE and Karlsruhe Institute of Technology play an increasingly crucial role.

### Small Scale Renewable Energy Systems

Research on energy systems is very important in order to find ways to reduce primary usage. There are a variety of multifaceted questions regarding the future of decentralized energy systems. An example such as "How can we effectively deal with fluctuating energy supply and reverse energy flow", and similar questions are investigated within the cooperative graduate school "Small scale renewable energy systems" (abbreviated: KleE).

KleE is a collaboration between the University of Freiburg, Offenburg University, and Fraunhofer Institutes ISE and IPM (Freiburg). Within KleE more than 12 PhD students are researching possible ways to increase the overall share of energy generated by small scale renewable energy systems. Current efforts are aimed at improving advanced energy converters and by taking into consideration interaction with society.

### Solar Thermal and Energy Efficiency in Buildings

Energy consumption in buildings accounts for a major share of primary energy consumption worldwide. Research and development of more energy efficient buildings will lower the impact of the construction sector on the traditional energy sector.

Investigations into the application of large-scale solar thermal facilities for space heating and cooling are currently in progress. The improvement of operation modes through the application of model-predictive control is also a current topic under investigation.

### Biomass

Germany is a country with limited solar energy resources. Therefore, biomass feedstock is a very important source of renewable energy. At Offenburg University, research is performed on the thermal and biochemical conversion of biomass. Special attention is given to the conversion of solid biomass into biogas that can be fed into the gas grid. The figure shows a test rig, where the biogas yield of fermenting processes is investigated by varying different parameters (e.g. the composition of the substrate).

### Battery and fuel cell technology

Electrical energy storage plays a key role in an energy economy with large amounts of solar and wind power as well as it is the key requirement for electromobility. Batteries, fuel cells and electrolyzers offer high-efficiency energy conversion and large storage capacity. At Offenburg University, both the fundamental aspects of electrochemistry (such as, ageing reactions limiting battery lifetime) and the integration of energy storage into systems (such as, electrolysis for power-to-gas in smart microgrids) are investigated. Results from the research

activities directly enter teaching. More information on the research activities is available on the websites of the research group Electrical Energy Storage, please click here: [Electrical Energy Storage \(EES\)](#)