Solar power storage units reduce costs of the Energiewende

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The batteries store solar power and feed it into the mains of HIU, if required. Credit: Frederik Elschenbroich

The increasing share of electricity based on solar and wind power results in an increasing load of distribution and transmission grids. At the 'Helmholtz Institute Ulm (HIU) for Electrochemical Energy Storage', the KIT demonstrates how modern high-performance batteries and smart controls make renewable energy compatible with the grid. Expensive and controversial grid extension measures can be reduced in this way. The solar power storage system with a 76 kWh battery unit started operation at HIU today and supplies the building with electricity.

"The transformation of the energy system in Baden-Württemberg, Germany, and Europe is a big challenge. Modern storage technologies

are a major approach to solving this problem," says Director-General of the Baden-Württemberg Ministry of Science, Research, and the Arts, Simone Schwanitz, on the occasion of the official opening of the solar power storage system. "With this system, the KIT builds a bridge between fundamental research and application."

"The solar power storage system at our institute in Ulm shows what future-oriented technologies for the transformation of the energy system may be like," explains Ulrich Breuer, Vice President for Finance and Business Affairs of Karlsruhe Institute of Technology. "We demonstrate that economy and ecology do not exclude each other, but may give rise to marketable solutions."

"Strengthening and clustering of the competences of Ulm University, KIT, and the other partners for research into and development of modern battery technologies at HIU has now started to bear fruit," says the President of Ulm University, Karl Joachim Ebeling. "The new solar power storage system at Ulm is a successful contribution to the Energiewende."

"The new storage system provides multiple benefits for our institute," explains Horst Hahn, Director of HIU: "Firstly, KIT can study intelligent control strategies for a grid-compatible operation of solar storage units. Secondly, this system will be used to test novel battery materials under real operation conditions in the future. The new storage system will also serve as a test laboratory and, as a by-product of research, it supplies electricity for the operation of the institute."

The storage system is equipped with a smart control unit developed by KIT. It ensures that electricity is not fed into the public distribution grid. Grid load is reduced by cutting the supply peaks of the photovoltaics system and the load peaks of the consumers at the institute. Hence, economically efficient and grid-compatible system operation is

guaranteed. An autonomous, self-learning prognosis tool calculates the consumption and production data to be expected and, on this basis, optimizes energy management over the day.

"The control is the brain of the facility. Here, it is decided what happens with the solar power. In fact, this is a highly complicated task, because the expected solar energy yield has to be distributed in the institute and battery, such that optimum efficiency is reached," Nina Munzke explains. She is responsible for software development under the Competence E Project of KIT. "For the development of a reliable, energy- and cost-optimized operational management system, two years of hard work of our team were required. Now, we are all happy that the software works in a real application and everything runs smoothly." The next step planned by KIT is the commercialization of the software by a startup company.

Data of the solar power system:

Photovoltaics peak power 31 kW
Battery capacity 76 kWh
Reduction of mains power consumption
at HIU per year 31 MWh

The Competence E project covers all research aspects from the battery materials to the electric storage system in a way that is unique in Germany. With an open technology platform for battery-electric vehicle drives and stationary energy storage systems, the systemic approach is aimed at developing industrially applicable solutions and their production methods. Thanks to integration along the chain of values added, battery systems with an energy density of 250 Watt-hours/kg are to be manufactured at costs of EUR 250 per kilowatt-hour by 2018. This will be an important step towards the energy turnaround and reaching climate objectives: Increased storage capacity or stationary storage

systems to compensate the fluctuation of renewable energies and enhance the range of electric vehicles for increased acceptance.

More information: www.competence-e.kit.edu/english/index.php

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