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BEST – Bioenergy and Sustainable Technologies GmbH / BIOENERGY 2020+ GmbH

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Self-learning energy management: Saving energy intelligently

Due to the increased integration of renewable, mostly volatile energy and the increasing coupling of different sectors (electricity, heat, mobility), there is the need for an integrated energy system in which all components interact efficiently. The Styrian COMET Center BEST - Bioenergy and Sustainable Technologies GmbH researches and develops optimization-based, predictive control strategies for this purpose.

The continuous expansion of (volatile) renewable energy generation and the coupling of different energy sectors, such as heating, cooling and electricity, have significantly increased the complexity of the energy system. Efficient operation is becoming increasingly difficult, which has an impact on the best possible use of renewable energy and thus makes new control strategies essential. This applies to larger systems such as district heating networks as well as to the area of private households. BEST has been researching such control methods for complex energy systems for over ten years.

Impacts and effects

An energy system typically consists of a large number of components; in the simple case of a single-family home, this could include, for example, a biomass furnace, a buffer storage tank, and a solar thermal system or other controllable components. These components are coordinated by a superordinate control strategy, often referred to as an energy management system (EMS). In case of the EMS developed by BEST, this is a higher-level automatic, optimization-based operational control system for all

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controllable generators, consumers and storage units, which can be used for various applications such as district heating networks, industrial processes and sites or private households. It can predictively and proactively respond to changing conditions, such as the weather or fluctuating energy costs.

The path from research to market readiness

BEST's energy management system has been developed over years in various research projects and has been extended, tested and validated on a number of widely different demonstrators. Together with the Styrian company KWB Energiesysteme GmbH, these research efforts have recently led to a market-ready product. KWB's software-based solution called Clee (which stands for "Clever Energie einsetzen") takes control of the energy components installed in a single-family home and fits them together like a mosaic into a cohesive whole. Clee combines energy consumption data with learned user behavior and also includes location-specific weather forecasts to predict when and how much heat will be needed in the house and how much free solar energy will be available at that time.

A methodical approach for many applications

BEST's overall aim was to create a universally applicable method, a modular software framework, that can be used in many areas of application. The energy management system developed by BEST can therefore be used not only for single-family homes, but also for multi-family and commercially used buildings, neighborhoods, district heating networks or the energy system of industrial sites. A particular focus of current related research activities is also on its application in renewable energy communities.



Copyright Figure: KWB

Project coordination (story)

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Project partner

- KWB Energiesysteme GmbH, Styria
- TU Graz, Institute of Automation and Control, Styria

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