Intelligent software for district renewable energy management

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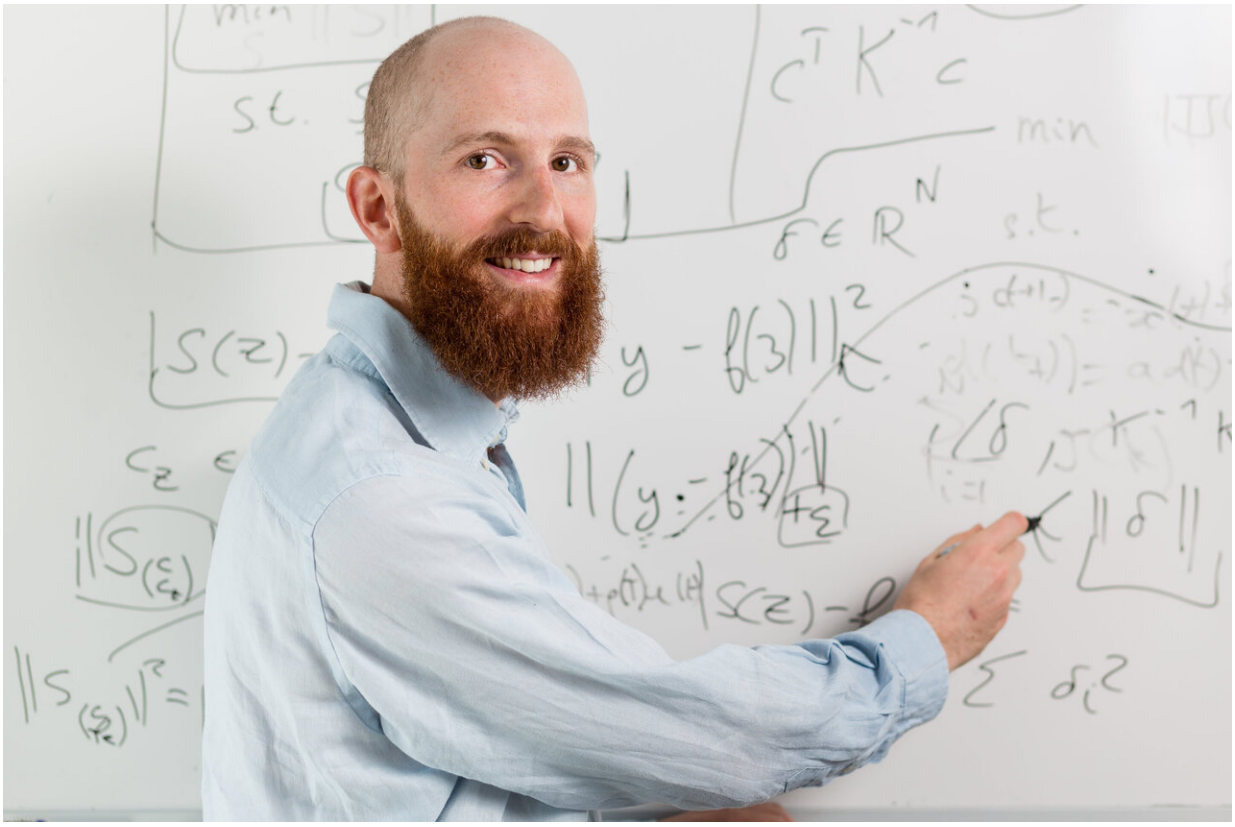

CSEM has developed Maestro, an intelligent software application that can manage and schedule the production and use of renewable energies for an entire neighborhood. The system can process a full range of parameters relating to heat pumps, solar panels, rechargeable batteries and electric vehicle charging stations - and generates a real-time strategy to optimize energy costs. Maestro has already been installed in two Swiss homes. Credit: Reto Duriet

New homes are increasingly being outfitted with solar panels, heat pumps, rechargeable batteries and other means of producing and storing heat, electricity and gas, all of which interconnect with the electrical grid. At the level of an entire neighborhood, these decentralized, intermittent energy sources form a complex network, which can also include energy-consuming installations such as electric vehicle charging stations.

Managing these multi-energy systems and optimizing energy costs raises a number of questions. Should energy be consumed when it is produced, sold to the grid, or stored for later use? And how should various energy sources be distributed if there are groups of consumers generating their own energy?

Orchestrating the production and consumption of energy

CSEM has developed smart, predictive software capable of providing real-time answers to these questions. Designed for non-specialists, it makes use of weather forecasts, data from local infrastructure, residents' consumption habits and market energy costs. As its name indicates, Maestro is like an orchestra conductor that automatically manages resources and keeps costs down. An online simulator, based on a building with eight family apartments, is available here.

Determining the best time to consume energy

"All of Maestro's decisions are based on cost management," says Tomasz Gorecki, one of CSEM's engineers behind the system. "When a solar panel is in use, for example, the software can tell you whether it's more advantageous to charge your electric vehicle, store the energy, or sell it to the grid. The system works for individual homes, but it could also

prove to be very useful for a self-sufficient community, sharing various renewable energy sources across several homes," he adds. The system has already been successfully installed in two private homes and in an apartment building in collaboration with Soleco. Negotiations are underway to fit out an entire neighborhood currently under construction in Zurich. Maestro was also presented at the IFAC World Congress in Berlin.

How Maestro works

The software is easy to use and can be quickly adapted to individual neighborhoods. To start with, parameters such as solar panel size, buildings' surface area, battery storage capacity and user preferences and priorities are fed into a planning tool.

Production data from energy installations, provided by sensors, are then sent to the cloud, where Maestro automatically compares possible consumption decisions and identifies the most cost-effective one. Instructions are sent back to the computer, which carries them out on site.

Maestro can incorporate boilers, heat pumps and electric vehicle charging stations, as well as electric batteries, renewable energy sources such as solar panels and wind turbines, power-to-gas facilities, thermal storage tanks, and more.

Specific questions

What sets Maestro apart from other energy management systems?

Other systems on the market are designed only for individual homes and often employ a very simple mechanism of increasing power

consumption whenever solar energy is produced. Maestro, on the other hand, can be used just as well for an entire neighborhood, where the network is more complex. It can also accommodate other energy-consuming installations such as electric vehicle charging stations and home heating and cooling systems. What's more, Maestro looks at weather forecasts for the coming days, which means that it can factor future needs into its consumption decisions. More broadly, the system is designed to keep costs down.

Could this focus on cost actually lead to increased energy consumption?

No, that shouldn't happen. Whenever surplus energy is produced, for example, the system will sell it to the grid if storing it for later use wouldn't be possible or cost-efficient. In making this decision, the system takes into account the losses that would be incurred by storing the energy in batteries. It's all about determining the best time and most rational way to use the energy.

What sort of cost savings are possible?

The cost savings will vary from home to home and user to user. A preliminary study on the first house running Maestro revealed an approximately 20% reduction in heating costs alone.

More information: To learn more and test the online simulator, go to: www.csem.ch/page.aspx?pid=126438

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https://techxplore.com/news/2020-09-intelligent-software-district-renewable-energy.html