Innovation type:
Computer model

TRL: 3

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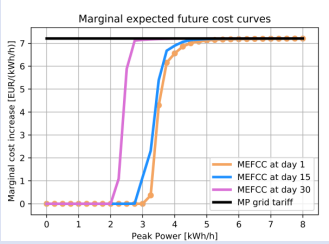
Target group:

Actor/ purpose	x
DSO, TSO	X
Technology provider	X
Member organisation	X
Market operator	X
Research/ Consultancy	X
Teaching	X



Plot showing the marginal cost increase of a buildings' total cost based on the highest peak import, when exposed to a monthly measured-peak (MP) grid tariff. The curve considers more days over the month the earlier in the month one analyses.

SDP model for operation planning of flexible resources in buildings

The goal of this work has been to find the value of flexibility for buildings in a long-term operational setting, which considers longer periods (from days to months) and uncertainty.

Challenge

Including the future impact of current decision-making within building energy system scheduling can be crucial when future long-term operational costs are considered. Without including the future long-term value in a short-term setting, the operational planning can be inaccurate for the total picture. Instruments that couples decisions in time, like monthly capacity-based grid tariffs and yearly zero-emission compensation should be taken into account when scheduling building load and utilization of flexibility, especially since the long-term future can be uncertain.

Solution

The model made is a long-term operational model inspired by water value calculation in hydropower. The model captures the future (uncertain) impact of current decision-making through the use of non-linear cost curves. Through the use of Stochastic dynamic programming (SDP), the model analyses from the last day to the first day all stochastic results that can occur for a specific state variable (for instance the highest measured peak import for a building). The non-linear curves represent the future cost increase by affecting the state variable, which shows the sensitivity of this variable.

Potential

The model can be further developed into a practical operational tool for scheduling of building energy systems. The long-term planning can be combined with a short-term operational model so that both the short-term and an overview of the future is also considered. It can also be utilized by grid companies who want to study in detail how flexible end-users can respond to different grid tariffs and grid limitations.

Reference in CINELDI

The model is developed by Kasper Thorvaldsen as part of his PhD project financed by FME CINELDI (50% and FME ZEN (50%).

K. Thorvaldsen, S. Bjarghov, H. Farahmand, The flexibility management in a household under uncertain demand with measured peak grid tariff, Working paper, 2019.