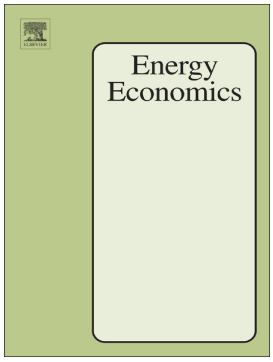

What drives profitability of grid-connected residential PV storage systems? A closer look with focus on Germany

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What drives profitability of grid-connected residential PV storage systems? A closer look with focus on Germany

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Abstract

This paper examines the drivers for profitability of grid connected residential PV battery storage systems for the German market setting and gives a short-term outlook on possible developments until 2020. For this purpose, we develop a mixed-integer linear optimization model of a PV battery storage system that minimizes the electricity cost from grid purchases and employ it to study two exemplary households. In contrast to most existing studies, we consider the following issues: Our calculations are based on households' electricity demand and PV production profiles in high temporal five-minute resolution. We take regulatory and fiscal treatment of so-called "prosumers" explicitly into account. Furthermore, we derive cost functions characterized by size-dependent, non-constant specific PV investment cost as well as by separated cost factors for the sizing of the storage systems´ capacity and its power electronics. In this context, we also clarify the interaction between possible peak demand coverage, rates of self-sufficiency and profitability of different system configurations. Finally, our analysis compares different modelling approaches regarding assumptions about perfect foresight horizons. Results show that modelling assumptions for regulatory and fiscal treatment as well as for specific investment cost can have significant impact on the economic assessment, and therefore should receive more attention in future. Besides this, our calculations reveal that economic incentives for investments in residential PV storage systems can gain great momentum within the next few years.

Keywords: PV; battery storage; prosumer; self-consumption; selfsufficiency; energy transformation

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