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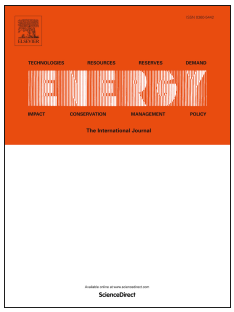

Optimal design of energy conversion units for residential buildings considering German market conditions

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Optimal design of energy conversion units for residential buildings considering German market conditions

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Abstract

Many countries have passed governmental action plans to support the installation of renewable energy sources. However, most studies dealing with the optimization of building energy systems neglect a precise modeling of such subsidies, although these subsidies are specifically designed to strongly influence system setups. Therefore, this paper extends a model for the optimization of energy systems by a more accurate consideration of storage units and enhance both models by accounting for major German pieces of legislation aimed at supporting renewable energies. Additionally, we consider typical German market characteristics, in particular the availability of multiple gas and electricity tariffs.

We compare our model with the original formulation regarding a pure cost minimization and a forced reduction of CO_2 emissions for three new buildings located in Germany. The results imply that the considered subsidies strongly support the installation of PV modules and CHP units. Without these subsidies, batteries and solar thermal collectors become more important. Additionally, the findings illustrate that the new storage model is slightly more accurate, but only marginally affects the total annual costs and required computing times. The conducted sensitivity analysis has shown that the obtained results are relatively

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