

# Renewable Energy and Resources & Energy Materials and Fuel Cell Research

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## Optimized use of renewable energies to realize nearly zero energy buildings

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The building sector is responsible for 40 % of the global energy consumption. At the same time, the usage of fossil fuels, e.g. oil or gas, comes along with a shortage of such resources, leading to a significant price increase in the future. The German government pursues the goal to cover 80% of the primary energy usage with renewable energies until 2050. This is a challenge for the operation, reorganization, and alteration of the energy supply concept. A fluctuating supply of energy from renewable energy sources needs appropriate, efficient and sustainable technologies to create a safe and constant energy supply system. The aim is to satisfy the demand by a maximized usage of renewable energies on the building to match energy supply and energy demand of a building. The utilization of simulation-based optimization tools permits an early estimation of the potentials of renewable energies at an early planning stage and the integration in an overall energy supply system. With the help of a thermal-energetic building simulation model, which will be simulated in TRNSYS and an external optimization tool (GenOpt) these potentials will be considered in detail to realize nearly zero energy buildings. The focus of this study is to compare different optimization algorithms regarding their potentials of the optimized usage of renewable energies and the numerical determination of a global minimum of the objective function. The goal of this project is to generate meaningful and resilient results by using a simplified building model and a general valid objective function.

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