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Investigating the demand side flexibility of the building stock. Philipp Mascherbauer, Energy modeling

Abstract

With a growing share of volatile renewable electricity, demand response becomes increasingly important to maintain electricity grid stability. Shifting demand in the residential sector can effectively reduce demand peaks in the electricity grid. This paper addresses the following research question: How can active demand response measures of buildings with heat pumps in the residential sector affect the aggregate load profile on the national level? In order to deal with this question, an optimization model is developed. It takes the detailed building stock of a country by building archetypes into account. Occupants' behavior is considered by assigning different indoor set temperatures and days of absence. Minimizing each building type's end-users cost, assuming a dynamic electricity price function, is the optimization algorithm's objective function. Thereby, the focus is on space heating, cooling, and hot water production. Non-heating induced electricity and hot water consumption is exogenously derived. Expected results include load profiles of a representative building in Austria for a particular building archetype considering the demand response of the space heating and hot water end-use. The cost reduction and the change in the load profile will be quantified. Subsequently, all buildings' load profiles in a NUTS1 region are aggregated and compared to a current profile that does not consider demand response in this region.