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Forecast of the distribution of heat pumps based on building structure data as part of cross-sectoral energy network planning

In order to reduce greenhouse gas emissions, the degree of electrification of the heating and transport sectors is increasing, among other things. This is creating new challenges for the energy networks. A cross-sectoral view of the energy system is required in order to plan the energy networks and thus prepare them for future requirements. Such a holistic approach is currently the subject of various research projects under the heading of cross-sectoral energy network planning. In this paper, one possibility of cross-sectoral energy network planning is explained and one component of the approach is discussed in more detail.

The cross-sectoral energy network planning described in this paper is aimed at re-planning the energy networks in existing areas. New development areas are not taken into account. The approach is based on building structure data. In a first step, individual buildings in a test area are categorized and grouped into typical districts. Irrespective of the categorization and district division, the buildings are examined for the probability of adoption of decentralized energy systems, such as heat pumps or photovoltaic systems. The probabilities are used to allocate decentralized energy systems to the buildings in the test area. The distribution of energy systems is validated using Germany-wide scenarios, which are regionalized to the test area. The scenarios differ, for example, in terms of their degree of centrality in relation to the energy supply. The electricity, gas and heating networks are planned based on the assigned decentralized energy systems. Different recommendations for action are developed for the districts identified in the first step, depending on the prevailing building structure.

This paper examines the cross-sectoral energy network planning process and explains in detail the regionalization of Germany-wide scenarios at building level using the example of heat pumps.

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