The role of district heating in the future Danish energy system

In the EU and in Denmark, the aim is to reduce dependence on fossil fuels and to use energy more efficiently. District heating and combined heat and power have significant potential with regard to achieving this aim. New technologies may make individual solutions such as electric heating, heat pumps and micro-CHP more attractive than previously. Therefore, the competitive conditions between district heating and other types of heating may change in the future. The question is therefore whether district heating can contribute to ensuring the sustainability of future energy systems? Denmark is used as a case as the country has a high share of district heating and produces 20% of the electricity with wind power. The analyses are carried out using the electricity market model Balmorel, which facilitates cost optimization of operation and investments in energy production plants as well as electricity transmission. To be able to perform the analysis an extension of the model is developed, where it is also possible to optimize between investments in individual heating plants or in expansion of the district heating networks, depending on investment costs, energy density of the potential areas and their distance to existing district heating networks. Results show that district heating may contribute to the sustainability and security of supply of future energy systems and that under the given assumptions it is cost effective to increase the share of district heating up to 55e57% of the heat demand although substantial heat saving measures are installed.

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