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BOOK OF ABSTRACTS

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Stefan Petrovic received BSc and MSc degrees in electrical power systems from University of Belgrade in 2010 and 2012, respectively. In 2012, he joined Energy Systems Analysis group, DTU Management Engineering where he obtained PhD degree in 2017. Since then, he works as a Postdoctoral researcher in the same group. His main research interests are energy system modelling and GIS.

Comparing different district heating supply scenarios with energy savings and individual supply options in six European municipalities

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Reducing CO_2 emissions from the heating sector is an important task, because this sector constitutes almost half of the total energy consumption in Europe. Renewables-based and efficient heating and cooling systems are part of many city-level CO_2 emission reduction plans. Decarbonisation can succeed if different technologies, relevant for local climatic conditions and heating and cooling demand, are implemented. A detailed analysis requires a methodology that allows comparing the costs of individual heating supply, heat savings and district heating to derive a cost-optimal mix. The methodology should also account for local renewable energy potentials and district heating expansion potentials.

This study analyses six cases: Ansfelden (Austria), Brasov (Romania), Helsingør (Denmark), Herten (Germany), Litomerice (Czech Republic) and Matosinhos (Portugal). All the cases differ regarding fuel mix and coverage with district heating, heating demands of buildings stock, availability of renewables and waste heat etc. Therefore they represent the different challenges and opportunities on the local scale well. The main objective of the study is to analyze how technological district heating supply scenarios compete with heat savings and individual heat supply from a socioeconomic perspective up 2050.

The methodology in this paper consists of district heating modelling with energyPRO and iterative modelling of heat supply and heat savings costs with a purposely-developed Least Cost Tool (LCT). First, the technological scenarios for district heating supply are modelled in energyPRO, resulting in district heating production costs, depending on increasing or decreasing heating demand and district heating production technologies. Next, the building stock is aggregated according to construction periods and use, while the potentials and costs of heat savings are obtained from Invert/EE-Lab model. Then, the annuitized costs of heat from individual heating technologies are computed. Finally, for each municipality, a cost-optimal combination of heat savings, district heating and individual supply is calculated.

The results depict the different challenges and opportunities for decarbonisation of municipal heat supply in Europe. In general, heat savings and district heating expansion pay off in all the cases analysed, but the source and share of renewables vary in each case. This analysis is further extended in the policy assessment, which investigates policy instruments enabling the technical solutions identified in this paper to be feasible from a private-economic perspective.