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# Editorial — smart energy systems and 4th generation district heating systems

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ABSTRACT

This editorial introduces the 16th volume of the International Journal of Sustainable Energy Planning and Management, which addresses different angles of district heating ranging from the planning of district heating systems and economic incentives for flexible district heating plants to comparisons between low and ultra-low-temperature district heating systems and methods for determining thermal conductivity in district heating pipes.

***Keywords:***

4th Generation district heating;
Spatial analyses;
Economics of district heating;
District heating pipes;

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## 1. Introduction

This editorial introduces the 16th volume of the International Journal of Sustainable Energy Planning and Management. This volume is a special issue from the *3rd International Conference on Smart Energy Systems and 4th Generation District Heating*, held in Copenhagen, Denmark in September 2017. Papers from previous conferences have been published in three previous special issues in this journal [1–3] as well as in the Elsevier journal Energy [4].

The conference series *International Conference on Smart Energy Systems and 4th Generation District Heating* is organized as an annual joint effort between the 4DH Strategic Research Centre in collaboration with Aalborg University, Denmark, with venues alternating between Aalborg and Copenhagen.

## 2. District heating and smart energy systems

In this volume, Knies [5] explores the dichotomy between individual buildings and over-all energy systems development from a planning perspective. Based on spatial data and fuzzy logic, Knies develops *suitability areas* that may be used in the process of planning for instance district heating systems.

Sneum & Sandberg [6] investigate economic incentives for flexible district hearting in Denmark, Norway, Sweden and Finland. Using energyPRO simulations and energy market optimisation, they determined that cogeneration of heat and power (CHP) plants combined with electric boilers were preferable in the Norwegian, Swedish and Finish energy systems. In Denmark however, framework conditions are so that biomass boilers are preferable.

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Best et al. [7] compare low-temperature (forward 70°C – return 40°C) and ultra-low-temperature district heating (forward 40°C – return 25°C) for the specific case *Zum Feldlager* in Germany. With half the ΔT for ultra-low-temperature district heating than for low-temperature district heating, flows increase calling for twice the pumping power and slightly larger pipe dimensions. Investments costs change marginally and the added auxiliary energy demand is small compared to the reduced district heating pipe losses and the improved operation of heat pumps supplying district heating.

Finally, Schuchardt et al. [8] investigate methods for determining the thermal conductivity of district heating pipes including both experimental work and numerical simulations of losses in their work.

## Acknowledgements

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