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Abstract

Close to 70% of greenhouse gas worldwide is emitted from urban areas (UN, 2011). Due to increasing urbanization, the situation will not improve unless cities take action to reduce the use of fossil fuels and increase energy efficiency.

By 2025 Copenhagen, the capital of Denmark, is planning to become CO_2-neutral (The City of Copenhagen, 2012). While the municipality will implement several activities within the existing city infrastructure, a development of a new seafront district called Nordhavnen will allow more radical energy transition. However, larger scale energy investments are costly, thus should be preceded by techno-economic system analysis. In the present study, a model called Balmorel is used.

This ongoing research examines how implementation of energy infrastructure in an urban area such as Nordhavnen can contribute with low CO_2 emissions, while remaining cost-efficient. This study focuses on integrated heat and electricity systems modelling of the area as part of Copenhagen and Denmark.

We construct and analyze scenarios for future energy supply of Nordhavnen, with focus on heating. The selected alternatives are: extension of Copenhagen's district heating scheme to supply Nordhavnen, individual ground source heat pumps and a large seawater heat pump. The assessment focuses on capital cost, total operation and maintenance cost, fuel cost and CO_2 emissions.

The preliminary results of this study show that individual heat pumps scenario is optimal from a socio-economic viewpoint. However, due to relatively small differences among scenarios the results will be examined further and extended by sensitivity analysis focusing on assumptions such as e.g. future heat demand, COP of heat pumps and varying technology prices.

References

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UN, 2011. Cities and Climate Change: Global Report on Human Settlements 2011.