DTU Management Engineering
Department of Management Engineering

Urban energy transitions: energy modelling and analysis of drivers and barriers

Sara Ben Amer-Allam, PhD student in energy planning

Urban areas aspire to achieve ambitious greenhouse gas emission reduction goals.

Cities are driving energy transitions worldwide. Many Danish municipalities implement ambitious climate and energy policy aiming to reach carbon neutrality within next decades. By determining the socio-economically optimal energy investment decisions for Danish cities this study will aid to advance planning of urban energy systems in a way that allows to reach CO_2 goals cost-efficiently. Such knowledge may ensure optimal sustainable planning of urban electricity and heat systems and overall city development today and in the future.

What is the economically optimal configuration of a sustainable urban energy system?

While national scale energy modelling has a long history, recently the importance of local scale modelling approach has emerged, allowing quantitative assessment of sustainable and smart cities. My PhD work focuses on mathematical modelling of urban energy (electricity and heat) scenarios for three cases: the Danish capital – Copenhagen and two middle-sized municipalities: Helsingør in eastern Denmark and Sønderborg in western Denmark. The case of Copenhagen concentrates on finding the optimal heat supply for the new waterfront district Nordhavnen; the study of Sønderborg assesses alternative energy scenarios focused on heat pumps, electrolysis and improved efficiency of biomass utilisation; the case of Helsingør evaluates heat savings and renewable energy implementation in the municipal heating network.

What are the drivers and barriers for implementing strategic energy plans?

Optimal investment decisions are important, but making recommendations about facilitating urban energy transitions towards sustainability is impossible without describing non-technical drivers and barriers to energy scenario implementation. Using interviews with stakeholders and surveys, these drivers and barriers will be identified and analysed. The objective will be to assess the performance of energy transitions in case municipalities and the enabling or limiting factors.

Cities should invest in energy savings, heat pumps and district heating expansion in order to achieve ambitious climate goals.

Our preliminary results show that a mix of different solutions is required if cities are to reduce their CO_2 emissions. The driver and barrier analysis will reveal other important aspects in the urban energy planning process. The final outcomes of the PhD study will provide insights into how to effectively plan and implement renewable energy and energy savings in urban energy systems.

Contact:
Sara Ben Amer-Allam
Produktionstorvet, building 426, room 123
DK-2800 Kgs. Lyngby
+ 45 46775125
sbea@dtu.dk
www.man.dtu.dk

Supervisor:

Per Sieverts Nielsen

Collaborating partners:

CITIES

progRESs HEAT

Funded by:

PhD Programme, Systems Analysis, DTU Management Engineering

Start and completion date:

1st December 2013 to 2nd June 2017

UNEP DTU partnership

Management Science

Quantitative Sustainability Assessment

Systems Analysis

Engineering Systems

Technology and Innovation Management