DTU Management has deployed a diverse tool kit to study the future aspect of district heating

DTU Man is one of the 16 players involved in this innovative project. DTU Man has conducted impactful research on various important aspect of district heating. These aspects relates to digitization of district heating, understanding the impact of inconsistence discount rate on district heating investments, and future long-term development pathways for district heating sector.

AI based anomaly detection in District Heating networks

DTU Man has developed a deep learning-based anomaly detection algorithm capable of detecting anomalies in district heating supply, e.g., temperature, pressure and leakage, etc, as well as a lightweight container-based data stream processing framework for the Industrial Internet of Things. Energy demand management is crucial as it helps to discover customers' consumption behavior and to better plan energy supply. We therefore developed visual analysis algorithms and a tool that allows users to interactively explore energy consumption patterns in both spatial and temporal dimensions, identify energy saving potentials and plan energy supply.

Impact of discount rate

DTU Man has explored the public guidelines for district heating investment. The study identified inconsistencies in the so-called 'embedded discount rates' in the guidelines. Discounting is performed to evaluate projects over the economic lifetime of the project[1].

These inconsistencies may lead to false rejection of low-carbon district heating projects. This finding has high relevance in the regulation of district heating projects, since prerequisites set in such guidelines determine the which variables to include in feasibility studies of district heating projects.

Specifically, the approach to discounting is not entirely consistent, since the guidelines' input data (e.g. fuel and electricity prices) are themselves subject to embedded discounting, which may be entirely different from the rate formally required by the Danish Ministry of Finance. This is likely to constrain the build-out of low-emissions capacity, in part because CO2-emissions are valued relatively low.

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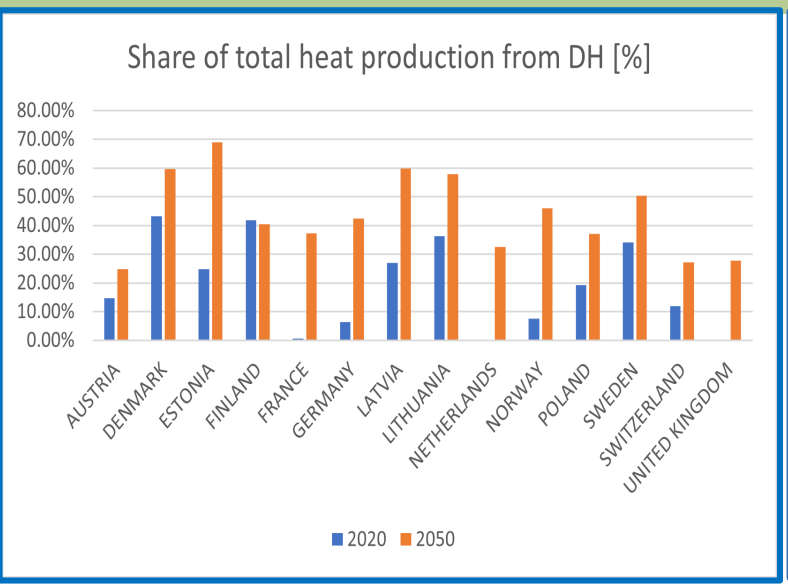
Long-term planning using energy system model

Decarbonization pathways for Danish district heating

DTU Man has used energy system investment optimization model Balmorel to study the future development trends for the district heating sector in Denmark. We have developed several new modules (add-ons) for Balmorel. These modules comprehensively model the essential dynamics of the heating sector, which include investment competition between heat savings measures, district heating expansion, and individual heating technologies. Thus, the model can now optimize investment into the whole energy system by taking into the above-mentioned dynamics of the heating sector [2].



Key Findings

- Earlier phase out of natural gas is possible as it inflict a small system cost.
- Expansion potential of District Heating is huge especially in central and northern European Countries.
- Public guidelines may lead to falsely rejecting low-carbon district heating projects

European wide assessment of district heating potential

Furthermore, DTU Man has in HEAT4.0 been using another version of Balmorel to study the potential role of district heating in decarbonizing the energy sector in several European countries. Most of the northern and central European countries are modelled. The heat demand of each country is divided into five groups, where each group is assigned a different district heating expansion cost based on corresponding heat demand density. Such a modelling framework enabled us to study the broader picture of the role played by district heating in decarbonizing the European energy sector.

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