NO. 2 / 2017

HOT|COOL

INTERNATIONAL MAGAZINE ON DISTRICT HEATING AND COOLING

FOCUS

THE WINTER PACKAGE

CONTENTS

HOT|COOL

HOT|COOL is published four times a year by

DBDH
Stæhr Johansens Vej 38
DK-2000 Frederiksberg
Phone +45 8893 9150
info@dbdh.dk
www.dbdh.dk

Editor-in-Chief:
Lars Gullev, VEKS

Coordinating Editor:
Kathrine Windahl, DBDH

Total circulation:
5,000 copies in
50 countries

ISSN 0904 9681
Layout:
DBDH/galla-form.dk

Pre-press and printing:
Kailow Graphic A/S

By Sara Ben Amer-Allam, PhD fellow at Technical University of Denmark (DTU), Marie Münster, Senior Researcher at Technical University of Denmark (DTU) and Lukas Kranzl, Senior Researcher at Vienna University of Technology

KEY SUCCESS FACTORS FOR DISTRICT HEATING AND COOLING FOR SIX CASES ACROSS EUROPE

– LESSONS LEARNT FROM THE ONGOING PROGRESSHEAT PROJECT

What do six local authorities in six EU countries (Austria, Czech Republic, Denmark, Germany, Portugal and Romania) have in common? They all want to improve their heating and cooling supply in an affordable way, so that more energy savings are implemented, renewable energy is used and less CO2 is emitted. These objectives are among the main drivers for the ongoing EU project progRESsHEAT [1]. The results so far are promising: they show that there is a techno-economic possibility for achieving these goals, but the current policy framework only allows for modest energy savings and expansion of district heating and cooling based on renewables and waste heat. However, we have identified several success factors for district heating and cooling implementation and expansion in some cases.

Map of the target countries, regions and case study municipalities of the progRESsHEAT project

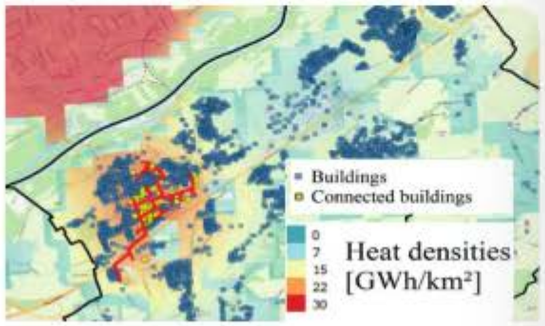
The process of transition to sustainable heating and cooling networks requires collaboration on different levels of decision-making: local, regional and national. progRESsHEAT is assisting policymakers in implementing the right policies with a model-based quantitative impact assessment of policies on all levels up to 2050. The project analyzes: current heating and cooling demands and future developments, long-term potentials of renewable energy and excess heat in the regions, barriers and drivers and possible policy interventions in scenarios up to 2050. progRESsHEAT provides policymakers with help in developing integrated, effective and efficient policy strategies aimed at achieving a fast and sustainable penetration of renewables-based and efficient heating and cooling systems.

Recent project results from the local case studies illustrate business cases for district heating in six different municipalities in the EU as well as the key success factors and main challenges and barriers for increased efficiency and sustainability of the European heating and cooling sector. The local analysis was conducted with energyPRO [2] used for modelling district heating networks and a specially developed spreadsheet-based Least-Cost Tool used for calculating costs of competing individual supply and overall results including viable heat savings for each local authority.

The selected municipalities differ in size, climatic conditions and renewable energy potentials. Since each case has a different energy system setup, a number of alternative scenarios were analysed, considering resources available. Below are the highlights of the six analysed cases.

Ansfelden, Austria

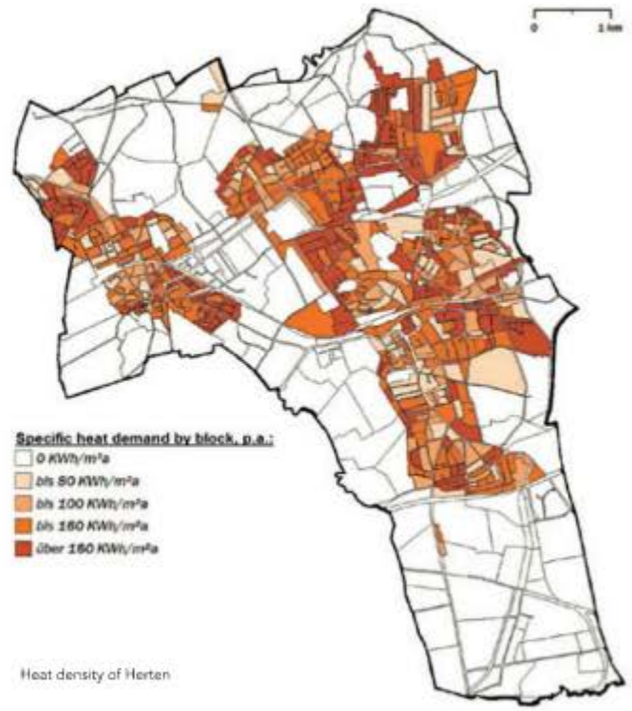
The current district heating network in Ansfelden supplies 12 % of residential heat and is based on biomass boilers, a backup natural gas boiler and thermal storage. An industrial site - a pulp and paper factory with excess heat potential is located nearby. While heat savings turn out to be an economically attractive option for Ansfelden, the resulting decrease of heat demand may lead to increasing heat prices for district heating supply. However, connecting a new development area planned within the municipality could increase the total heat demand for district heating. Another possible solution could be to utilize excess heat from the industrial site and to increase the connection rate via subsidies for biomass-based district heating and for district heating connection, as well as to set a binding climate goal for the new local settlement. The feasibility of these solutions will be studied further in the course of the project.



Heat density of Ansfelden

Herten, Germany

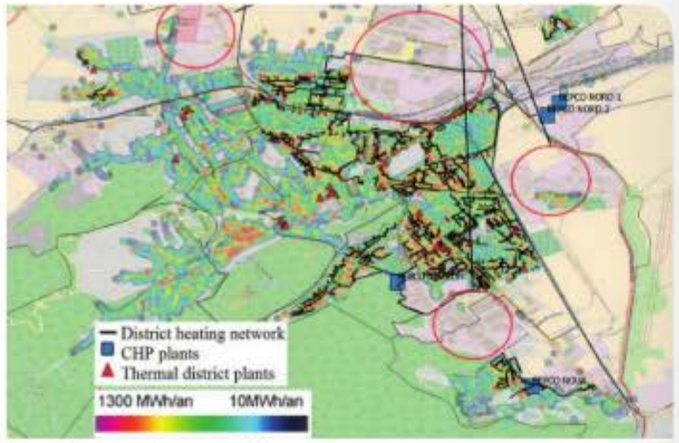
There are two separate district heating grids in the municipality: North, supplied by a coal CHP and South, supplied by a waste incineration plant, that in total constitute about 20% of the municipal heat demand. Several distribution networks individually connected to the district heating transmission line exist. In the future, a solar thermal field with pit storage would allow the solar fraction of about 20% to be achieved at approximately 20 EUR/MWh levelized cost of heat. Sufficient agricultural land for this purpose is available. Moreover, connecting new buildings can keep the heat demand on a constant level up until 2050 even if heat savings are implemented. Future work will focus on analysing the business case, including alternative tariff schemes, for large scale heat pumps separately or in combination with solar thermal systems and storage.



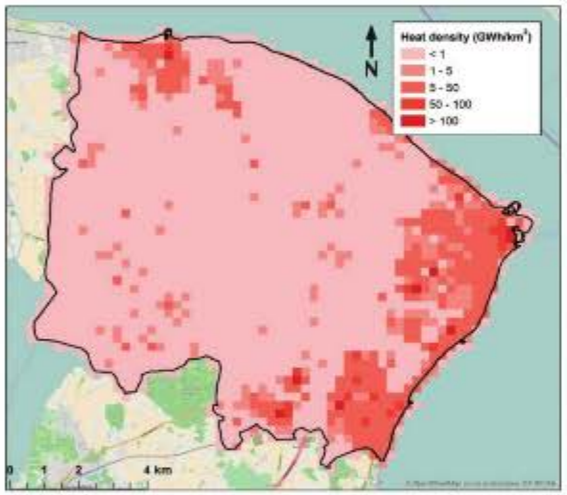
Heat density of Herten

Brasov, Romania

The old coal-fired district heating system in Brasov used to supply both industry and households. However, large industry sites closed down in 1990, thus the network, now only covering 5% of the demand, is overdimensioned and unreliable, with losses reaching 50%. The insufficient performance of district heating has led to customers switching to individual gas boilers. Renewing the district heating network until 2030 will allow decreasing losses to 10%. Under the assumption that saved heat can be sold to additional customers, district heating price will increase only by 12%, while if the existing capacity is fully used and new customers connect, the district heating price will decrease by 22%. The analysis will focus further on decarbonisation options such as district heating switching to biomass, solar heating and individual heat pumps and biomass boilers.



Heat density of Brasov



Helsingør, Denmark

District heating in Helsingør constitutes 35% of the total heat supply and is produced with natural gas CHP and with a waste incineration plant located in the neighbouring municipality. The planned investments in a biomass CHP, and in an expansion of district heating network (up to 41% heat demand, which is still below the Danish average of 50%), are feasible mainly due to biomass tax exemption and electricity generation revenue. About 36-42% reduction in heat demand is feasible; mainly in old buildings outside district heating areas. Several other alternatives were analysed and the results show that in the mid-term, large heat pumps and solar thermal collectors should be considered, if the district heating price is to stay competitive with individual supply options. While the socio-economic cost of heat production from biomass-fired district heating and large heat pumps is similar, the business profitability of heat pumps depends highly on future electricity taxation and this is the focus of policy analyses.

Heat density of Helsingør

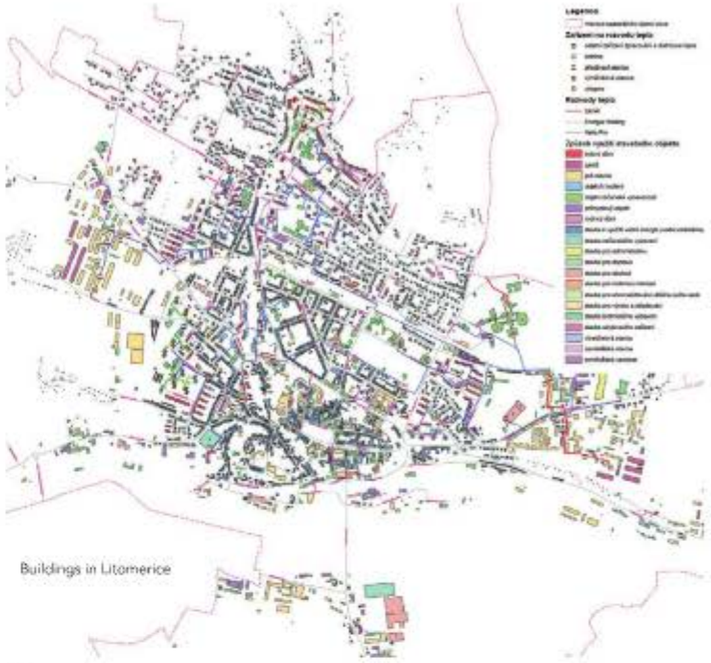
Matosinhos, Portugal

No district heating nor cooling is available in Matosinhos. The focus area within the municipality is the shopping mall and large stores, where individual gas boilers and compression chillers are currently installed with the cooling demand being triple the heating demand. All units have been constructed recently, so the existing solution is very cost-effective in comparison to alternatives. Nonetheless, a nearby refinery could potentially be an excess heat source for a decentralized network, showing lowest levelized cost of heat and achieving CO2 neutrality. Such connection could also be a first step towards establishing a larger district heating and cooling system in Matosinhos, with additional generation from solar thermal fields. In this case study, heat pumps would be viable only in combination with a compression chiller and photovoltaic systems, while solar thermal systems could reduce CO2 emissions and the cost of heat generation.

Focus areas in Matosinhos

Litomerice, Czech Republic

Currently, coal-based district heating in the municipality covers 37% of the overall heat demand, other sources being individual natural gas boilers (62%), biomass boilers and solar thermal collectors. Maintaining the level of individual natural gas boilers would not lead to the reductions in CO2 emissions which the municipality would like to achieve. For district heating, the conversion to a geothermal CHP is a feasible solution, because the municipality has large geothermal potential and such a scenario would allow fuel savings and would generate revenue by electricity production. It would also result in a substantial CO2 emission reduction. However, network reinvestments will also be necessary. Other analysed scenarios include large heat pumps and thermal storage, which in the future also appear to be more feasible than the current coal-based heat supply.



Buildings in Litomerice

Success factors for district heating and cooling

In the course of the project, the main success factors of district heating and cooling were classified into: planning, regulative and economic factors. Strategic local and regional heating and cooling planning requires long-term environmental targets at the local and national level, information campaigns and collaboration, good availability of geographical data, as well as competences and time to use planning tools at a local level. Regulation could provide zoning that would prevent double infrastructure (e.g. natural gas and district heating networks), ownership structures ensuring equal access to grids and possibly mandatory energy efficiency improvements. These could include requirements for heat savings in buildings, improvement of district heating and cooling grid and district heating and cooling expansion goals. Economic success factors include: access to inexpensive long-term financing or subsidies, risk-taking by industries, increased district heating connection rate in parallel with implemented heat savings in district heating areas to avoid district heating price increase, non-profit district heating and cooling, aligned taxes, tariffs and subsidies for: CO2, fuels, electricity for heat pumps and use of excess heat.

Further work

Most local case study analyses have revealed a techno-economic potential for district heating implementation and expansion but specific policy recommendations to improve the business case will be available in summer 2017.

For further information please contact:
Marie Münster (maem@dtu.dk)
or Sara Ben Amer-Allam (sbea@dtu.dk)
Technical University of Denmark (DTU)
Management Engineering
Systems Analysis Division
Produktionstorvet, Building 426
2800 Kgs. Lyngby

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 646573

Funded by the Horizon 2020 Programme of the European Union

References

[1] http://www.progressheat.eu/
[2] http://www.emd.dk/energypro/

Project partners