Economic assessment of district heating potentials in EU-27 countries

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Overview

This paper provides an updated assessment of the district heating (DH) potentials across EU Member States (MS) considering future development of both heat demands and DH connection rates. This done by providing an overview of the current and future heat demand as well as DH connection rates in EU. The outcomes of the study are among all economic DH areas and DH potentials in each MS.

Methods

To calculate the average DH grid costs within potential DH areas, the levezied cost approach is used. For the identification of DH areas, two conditions should be fulfilled: 1) average distribution grid cost within a potential DH area should be below a given threshold; 2) The annual heat demand in the area should be above a predefined level. The levelized cost approach uses the linear heat density and effective width to estimate the DH grid costs. A recent study published by sEEnergies Project [1] provides an updated method of calculating effective width. According to this study, DH grids fall into two categories of distribution pipes and service pipes. Here, special focus is given to areas with low plot ratio in order to include them as potential DH areas where possible. Fig. 1 shows the imperical formula for calculation of effective width as a function of plot ratio. As it can be seen in the formula for the distribution pipes, in densed areas, effective width remains constant; whereas in the sparse areas it has an inverse relation with plot ratio. To model the impact of connection rates in sparce areas, an adjustment factor for the calculation of the effective width was defined additionally.

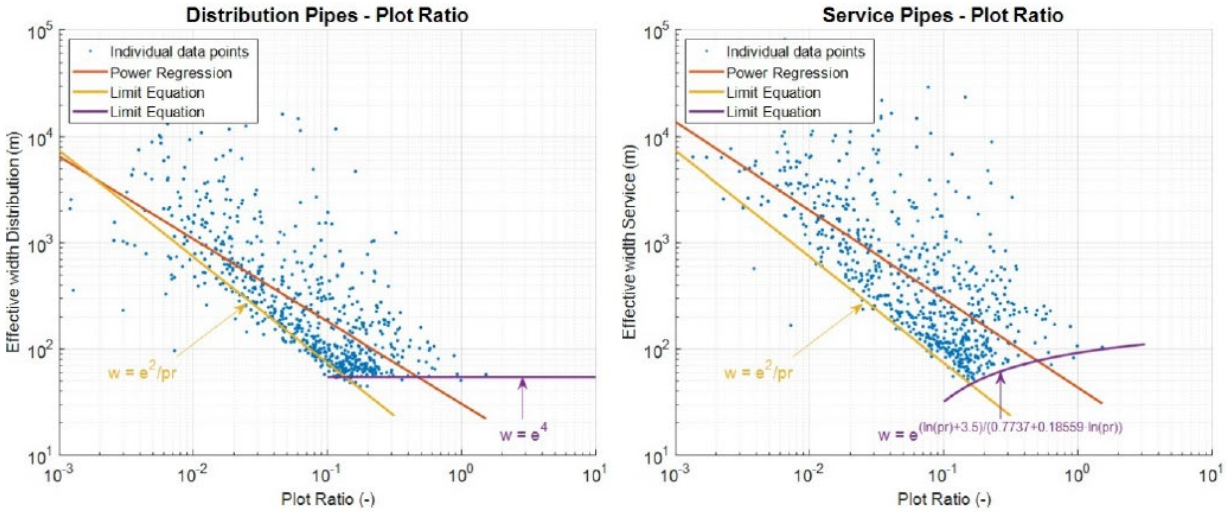

Fig. 1 Plot ratio Vs. Effective width for distribution and service pipes (Source: sEEnergies [1])

For the current heat demand, data from Hotmaps project was used. The heat demand in 2050, on the other hand, was obtained based on scenario developed in the project “Renewable Space Heating under the Revised Renewable Energy Directive” [2]. The actual DH connection rates were calculated based on energy balances and for the year 2050, an ambitious connection rate was considered.

A simplified version of the approach has been implemented in the EnerMaps Data Management Tool , which can be used to estimate the potential of District heating [3].

Results

The results show a mixed picture of DH expansion in different Member States. For example, for maintaining share supplied by DH from the total heat demand, it is necessary to expand and increase the existing DH girds, often due to the decreasing heat demand. While average DH grid costs in most of the Member States ranges between 23 to 30 EUR/MWh, there are a few countries like Estonia that demonstrate lower grid costs due to high connection rates and high heat densities in DH areas. In contrast, in countries with low starting connection rate like Netherland the overall grid cost leads to prices above 30 EUR/MWh. The study shows that in EU-27 countries, more than 40% of the heat demand is in regions with high potentials for implementing DH. Furthermore, around 70% of the heat demand in identified DH areas can be covered by DH.

Conclusions

This study considers costs of both distribution and service pipes, drawing a more accurate picture of the overall DH grid costs. In the study, we put a focus on the sparcely built regions and also suggested an approach for modelling the impact of the connection rates on the effective width in these areas. The heat demand scenario in this study involves a significant reduction in the heat demand until 2050. In spite of this reduction, the overall district heating potential in EU MSs can remain high. This can be guaranteed with a high DH connection rates in DH areas. Furthermore, high connection rates leads to lower levelized costs for DH grids and therefore, better competitiveness of DH system with other technologies.

References

[1] Persson, Urban, Möller, Bernd, Sánchez-García, Luis, & Wiechers, Eva. (2021). District heating investment costs and allocation of local resources for EU28 in 2030 and 2050. Zenodo. https://doi.org/10.5281/zenodo.4892271

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