FAVOURABLE POLICY FRAMEWORKS TO ENSURE THE FUTURE OF DISTRICT HEATING IN EASTERN EUROPEAN COUNTRIES – THE CASE OF BRASOV

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Overview

Decarbonising the heating sector is essential to reach the climate goals agreed on COP 21 meeting held in Paris. District heating (DH) in general is seen as an important technology to decarbonise the heating sector especially in urban areas. In many Eastern European cities DH-Systems are already in place. However, they face a number of challenges: These systems typically were installed in the former communist era to supply industry and residential buildings at a time. Although most of the industry broke down after the communist era, a lot of these systems stayed without any relevant re-investments into the infrastructure since that time. Thus, they often still have installed old supply technology and are based on fossil fuels and therefore are not suitable to reach the desired level of decarbonisation. High losses due to overdimensioned infrastructure and outdated technology make many DH-Systems economically unfeasible and lead to unsecure supply. The association with communism and the lack of confidence ends up in further disconnection of costumers. Many cities with a DH-System in Eastern Europe face these problems. The aim of this work is to find economically and ecologically sound solutions for the heat supply under these difficult conditions and to identify how local and national policy frameworks can be improved to realise such solutions and which may be applied to different regions in Eastern Europe.

Method

The assessment performed in this paper is based on a case study of the municipality of Brasov, located in the centre of Romania, representative for different cities in Romania and Eastern Europe. The modelling framework to analyse the research question combines different tools: (1) As a first step, the existing district heating system and possible alternative supply portfolios for the future of the district heating system were modelled in energyPRO [1] to obtain the district heating generation costs and the sensitivity of the costs to disconnection or additional costumers. (2) As a second step, costs and potentials for decreasing thermal losses through the building envelope (heat savings) were calculated for ten different building types with three different construction periods with the Invert/EE-Lab model [2]. (3) As a third step costs for supply of heat with five different individual heating technologies are calculated for the same building classes. (4) In a fourth step the municipality was divided into four different types of areas according to the availability of a current district heating network or the feasibility and costs of expanding the network into adjacent areas. The so-called district heating area is the area within 50 m of the current distribution network. In this area it is assumed that additional buildings can be connected to district heating without further expansion of network but by investing only in connecting pipes and heat exchangers. The so called next-to-district heating area is the area within 1 000 m of the current transport network. In this area it is assumed that further buildings can be connected by additionally investing into the current distribution network. The individual area is defined as the area outside the next-to-DH areas. The individual area is not supplied by district heating and is not sharing a border with existing district heating area. For the buildings located in Individual areas, it is necessary to invest in transmission pipes, distribution pipes, connecting pipes and heat exchangers to be able to connect to district heating. The expansion of district heating to scattered buildings which are spread across the municipality and are not close enough to other buildings is not considered to be an alternative. (5) As a last step, for all building classes and all areas within the municipality the cheapest combination of heat savings and the supply with district heating or individual technologies is calculated. This is done for a reference scenario and for various technical alternative scenarios depicting desirable futures regarding the heat supply portfolio of the district heating system. Different indicators like total system costs, total CO_2 emissions, share of renewables etc. are calculated both for the reference and for the alternative scenarios each with different policies that have the potential to create the required side conditions for the desired future technical scenarios. By comparing the indicators between the different scenarios, policy recommendations can be drawn that are favourable for the scenarios.

Results

Preliminary results show that in the future scenarios district heating is not the most economical alternative per se and therefore different policies should be implemented to guarantee a reconnection to the district heating and a higher renewable share in the system. A precondition for an economically viable district heating system is an enforced investment into the network infrastructure. Otherwise, the currently high distribution losses of about 50% would never make district heating a competitive solution. Under private economic conditions these high up-front investments result in too high capital costs and a non-competitive district heating price. Therefore investments into network infrastructure should be calculated with a time horizon of around 40 years and an interest rate below 2%. This can be either guaranteed by public authorities or consumer owned companies that invest into the network or by providing long term loans to a private company. Another prerequisite to make district heating solutions feasible are high connection rates of costumers. Therefore policies have to be adopted that secure high connection rates or that encourage customers to reconnect to the system. This could be mandatory heat planning for the municipality resulting in the definition of areas favourable for district heating where costumers only can choose other technologies under certain circumstances. To make fossil fuels less attractive and to incorporate external costs and damage caused by CO_2 emissions, the currently low taxes on fossil fuels in eastern European countries should be augmented by a price-component for CO_2- emissions. The assessment for Brasov showed that a CO_2-price of around 120 €/t would lead to a significant switch from natural gas boiler to district heating. And finally, to increase the share of renewable technologies in the district heating system, national funds could be given to support the investments into these technologies. All this policy measures should be accompanied by intensive and target-group oriented information campaigns and involvement of all stakeholders in order to ensure the achievement of the desired objectives.

Conclusions

Many district heating systems in Eastern Europe face huge problems due to historic reasons and the lack of investments in the past decades leading to now inefficient and outdated networks. The favourable policy framework described in this work, can trigger new investments to modernize these systems and bring back confidence and the required consumers. This is needed in order to use district heating as the most important means of reducing CO_2-emissions in urban areas.

References

[1] EnergyPRO, EMD International, http://www.emd.dk/energypro/

[2] Mueller A., Energy Demand Assessment for Space Conditioning and Domestic Hot Water: A Case Study for the Austrian Building Stock, PhD Thesis, TU Wien, Vienna 2015. http://www.invert.at/http://www.invert.at/