Viability of district heating networks in temperate climates: Benefits and barriers of cold and warm temperature networks

The decarbonization of the heat supply and the attainment of a higher security of supply demand the transition towards zero-carbon heating solutions. In dense urban environments, where the construction cost of a pipe network is relatively low, heating and cooling networks can deliver heating and cooling at a lower cost compared to individual solutions.

This paper builds on prior research by these authors mapping heating and cooling energy use in Bilbao, Spain, a city characterised by mild oceanic climate and a dense urban pattern. Areas within the city where heating and cooling networks could be more feasible have been identified taking into account the building stock characteristics and energy use, together with other urban and resource parameters, and a city district has been selected for further study.

Warm networks deliver heat at a sufficiently high temperature to be directly used by the consumers whereas cold networks employ lower temperatures, thus requiring heat pumps at the consumers premises. Research has highlighted as advantages of this newer configuration the possibility of delivering both heating and cooling with the same network, the lower capital costs of these networks and negligible heat losses. Nonetheless, comparisons between the two technologies have been seldom performed in the literature. In this paper, an economic comparison between these two solutions is presented for the selected district of Bilbao. Results show that cold networks require a lower investment in the actual network infrastructure but the distributed heat pumps increase the costs to a higher total CAPEX than in warm networks. Overall life cycle costs of heat are also slightly higher for cold networks than for warm networks. Other benefits and barriers for each of the solutions, for example regarding necessary space or speed and modularity of the implementation of the network are also discussed.

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