Optimal dimensioning of low-energy district heating networks with operational planning -
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Optimal dimensioning of low-energy district heating networks with operational planning: case study for existing buildings

Low-temperature operation in low-energy District Heating (DH) systems is rewarding for increased exploitation of low-temperature renewable energy sources, heightened efficiency at heat extraction, and intensified energy efficiency at heat distribution. Success of heat delivery in low-temperature operation such as 55 °C in terms of supply and 25 °C in terms of return was achieved through real cases located at Lystrup in Denmark, and “Greenwatt Way” project located at Scotland in UK as demonstration of low-energy DH systems being considered to supply heat to new houses with low-energy class.

In our former study the performance of in-house heating systems was investigated for changing levels of supply temperature with consideration given both to current high-heat demand and future low-heat demand value of an existing settlement. The over-dimensions obtained at in-house heating systems originally in design stage resulted in satisfaction of heat demand of the house in low temperature operation. In this paper the operational planning of the low-energy DH systems was investigated to reduce the dimensions of the distribution network with consideration given both to current high-heat and future low-heat demand situations. The operational planning was based on boosting (increasing) the supply temperature at peak-demand situations which occur rarely over a year period. Hence optimal pipe dimensions of low-energy DH systems were investigated based on the dynamic response of in-house heating systems with changing supply temperatures ranging between 55 – 95 °C. The boosting level of supply temperature was considered to be determined separately for current high and future low heat demand scenarios. As a conclusion it was found that 91% reduction in the heat loss from the DH network could be reached by use of operational planning in comparison to DH network dimensioned according to high heat demand situation.

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