

Integration of large-scale heat pumps in the district heating systems of Greater Copenhagen - DTU Orbit (08/11/2017)

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This study analyses the technical and private economic aspects of integrating a large capacity of electric driven HP (heat pumps) in the Greater Copenhagen DH (district heating) system, which is an example of a state-of-the-art large district heating system with many consumers and suppliers. The analysis was based on using the energy model Balmorel to determine the optimum dispatch of HPs in the system. The potential heat sources in Copenhagen for use in HPs were determined based on data related to temperatures, flows, and hydrography at different locations, while respecting technical constraints. The Balmorel model was developed further in order to provide a better representation of HPs, for analysing the seasonal variations of COP (Coefficient of Performance), and to represent the difference in performance of HPs connected to either distribution or transmission networks. The optimization yields roughly 3500 FLH (full load hours) for the HPs connected to the DH distribution networks when considering a current scenario. In a zero carbon-dioxide emission scenario expected in year 2025, approximately 4000 FLH, are achieved. In the case where HPs are connected to the DH transmission network at elevated temperatures, their operation decreases by roughly 1000 FLH. No significant impact was found when comparing fixed and varying operation characteristics of the HP.

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