Integrated Planning of A Large-scale Heat Pump In View of Heat and Power Networks

With the present trend towards smart grid and integrated energy systems, the potential benefits achieved by developing integrated planning and operation solutions crossing multiple energy sectors become recently recognizable. This paper investigates the problem of optimal planning for a large-scale heat pump (HP) - a component that links electric and heat utilities together, from an integrated perspective. The proposed method assures an optimal system design with the minimum expense on both capital expenditure (CAPEX) and operating expense (OPEX) for the heat network and the electrical network, given that the optional HP locations are already provided together with other technical and economic information needed for executing the planning exercise. The operational flexibility of the HP, i.e., the ability of reducing its electricity consumption from time to time, is also integrated into the planning method. The value of the proposed solution is demonstrated throughout a case study that resembles a live planning exercise conducted for a green field area in Denmark.