

# Distributed Optimization Procedures for District Heating Networks

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**Abstract:** Due to the uncertainty of demand, a mixture of hard legal constraints and soft consumer constraints optimization in district heating networks (DHC) was discarded in the past as solutions could not guarantee a sufficient robustness. The emergence of smarter homes and remote-controllable devices make new control and data generation options available, which can be used for optimization with real-time nonlinear model control predictive methods (NMPC) on a directed graph representing the heating network. As pipes and buildings in a DHC are made from different materials and subject to, e.g. different weather conditions, a DHC is in general non-homogenous. Therefore distributed constraint optimization methods (DCOP) in combination with differential equations have to be applied.

In this paper we derive formal properties that an optimization algorithm used in this setup has to meet and study several different modelling approaches for the DHC as well as the suitable DCOP in this scenario.

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