Aalto University
School of Engineering

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How does demand response in district heating connected buildings affect occupants, owners and the heating provider?

Title of the dissertation	Demand Response in District-heated Buildings
Contents of the dissertation	The objective of this dissertation was to examine the effects of demand response measures in the district heating connected buildings focusing on thermal comfort and individual room control. The case studies in Southern Finland and in a simulated district heating system were used to study the demand response in building and its influence on the district heating system. The idea of the thesis was to highlight technical feasibility and economic viability of demand respose and smart devices for different stakeholders. Practically, the dissertation examined use of Internet of Things in buildings for the energy company, for the building owners, and for occupants. The thesis developed rule-based control algorithms for the room-level temperature control via water-circulating radiator thermostats connected to a cloud service. These control algorithms were applied in district-heated office buildings. The system allowed for individual thermal comfort, while performing optimised and targeted heating control. In addition, a district heating system with dynamic heating pricing was modeled for evaluating demand response by shifting loads in time on the building level and by utilising a centralized thermal energy storage. As concluding remarks, the results showed that - The demand flexibility of district heating utilizing the thermal mass of buildings was of little benefit to the district heating company. - Demand response itself did not bring savings to the property owner either. - Field studies show that room-based control enables services for individual heating, which can not only save energy in a more controlled manner but increase occupant comfort.
Field of the dissertation	Energy Technology
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The dissertation is publicly displayed online 10 days before the defence at
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