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Special Issue Reprint

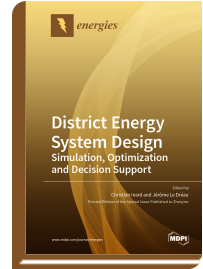
District Energy System Design

www.mdpi.com/books/reprint/2665

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ISBN 978-3-03936-366-7 (Hardback)

ISBN 978-3-03936-367-4 (PDF)

The articles presented in this Special Issue cover different aspects of the urban planning process, such as simulation, optimization or decision-making. The authors highlighted the importance of performing an integrated design of the district, considering different sectors, different energy vectors and different operation modes. In order to better integrate renewable and residual energy sources (R²ES), careful design of systems and storage solutions should be performed. Different storage solutions were tested, ranging from large-scale thermal energy storage to vehicle batteries or the thermal mass of buildings. Van der Heijde et al. (2019) proposed a two-layer design optimization algorithm to design a district heating network with solar thermal collectors, seasonal thermal energy storage and excess heat injection. Pajot et al. (2019) also performed an optimization of the sizing and control of energy systems in a district equipped with heat pumps, with thermal energy storage or thermal mass utilization. A hybrid distribution system, coupling the thermal and electrical networks, was proposed by Widl et al. (2019). Arnaudo et al. (2019) used the vehicle-to-grid (V2G) concept to decrease the overloading of the electrical distribution network during heat pump operation. Finally, Kazmi et al. (2019) proposed an integrated decision-making planning approach for a better integration of R²ES in the distribution network. The complexity of urban planning leads to the development of new tools and methodologies. Until now, operation was poorly integrated in the design phase. New urban building energy modeling tools were proposed by the different authors. These tools are either based on co-simulations or integrated solutions to be able to capture the fine dynamics of a district. The

generating the input data for the models was also discussed. Regarding the most articles proposed a two-stage optimization procedure to optimize both technical and design aspects. Mixed-integer linear programming (MILP) and genetic algorithms were often used to find optimal solutions.



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