

# Contents

**Preface — V**

**Foreword of the Editors — VII**

Simon Moeller, Michael Schneider, Sven Leonhardt

**Enablers and Barriers to the Sustainable Transformation of Urban Districts — XV**

**Contributors — LIX**

Sven Rosinger, Steffen Wehkamp, Georg Blum

**1 Presentation of the “ENaQ” Energy Transition Lighthouse — 1**

Steffen Wehkamp, Lucas Schmeling, Sven Leonhardt

**2 Regulatory and Legal Challenges for District Energy Systems in Practice and Research — 17**

Peter Klement, Patrik Schönfeldt, Lucas Schmeling

**3 Multi-Objective Design Optimisation of District Energy Supply – The Influence of Different Domestic Hot Water Concepts — 35**

Alexander Hill, Christian Pieper, Tobias Brandt

**4 District Energy Management Scheduling using a Participatory Local Energy Market — 53**

Oliver Norkus, Jens Wotte, Matthias Brucke

**5 Establishing a Smart City Data and Interoperability Platform — 75**

Maren Wesselow, Torsten Grothmann, Bernd Siebenhüner, Ulrich Scheele, Ernst Schäfer

**6 The Role of Citizen Participation in Developing a New Energetically Efficient Quarter – Limitations and Success Factors — 91**

Stefan Büscher, Silke Lorenz

**7 “Mixed Reality Systems in the Participation in Urban Land Use Planning.” — 109**

Marvin Schnabel, Moritz Elbeshausen, Sebastian Erdmann, Sascha Koch

**8 Participatory Processes in Geodata-Based Thermal Energy Planning — 119**

Katja Walther

**9 Climate District Neue Weststadt — 133**

Norbert Fisch, Tobias Nusser, Simon Marx

**10 Climate Impact of Green Hydrogen in an Urban Context — 145**

Holger Heible, Eva Michely

**11 Developing Sustainable City Districts: A Practitioner's Report on  
Klimaquartier Neue Weststadt — 161**

Alexander Müller-Dollinger, Mathias Oberhauser, Martin Neuburger,  
Walter Czarnetzki

**12 Design of a Mobility Infrastructure in the Urban District with Special  
Consideration of the Public and Private Charging Infrastructure and the  
Expansion of the Bus Overhead Line Network — 171**

Felix Mayer, Florian Tischer, Johannes Walbrunn

**13 Power System Supporting Control Strategy for Es\_West\_P2G2P – from  
Idea to Implementation — 191**

Felix Bader, Dominikus Vogl, Janika Gabriel, Eva Schulze

**14 Social Research to Enable Human-Oriented Energy Transition. Results  
from a Climate District — 205**

Bettina Dech-Pschorn, Gerhard Stryi-Hipp, Thomas Anton, Frank Elberzhager,  
Rolo Fütterer, Christian Persohn

**15 Integrated Research Approach of the Lighthouse Project  
EnStadt:Pfaff — 219**

Gerhard Stryi-Hipp, Diana Berg, Bettina Dech-Pschorn, Rolo Fütterer,  
Patrick Huwig, Martin Kohl, Stefan Staehle

**16 Need for Further Development in Urban Land Use Planning to Enable  
Climate-neutral Districts — 233**

Patrick Huwig, Thomas Anton

**17 Methods for the Development of Energy Concepts for Climate Neutral  
Neighbourhoods — 257**

Sara Schierz, Manuel Schaubt

**18 Greenhousegas Balancing and Life Cycle Analysis in the Context of Climate-Neutral Neighbourhoods — 267**

Frank Elberzhager, Steffen Hupp, Svenja Polst, Phil Stüpfert, Arne Surmann

**19 A Climate-Neutral Smart City District Supported by Digital Solutions — 279**

Arne Surmann, Manuel Utz

**20 Technologies for Climate Neutral Districts: Agent Based Energy Management and Blockchain Based Organization for Energy Communities — 295**

Sebastian Gölz, Christian Bär, Diana Berg, Frank Elberzhager, Jens Frank, Martin Kohl, Alexandra Rode, Stefan Staehle, Jörn Zitta

**21 Learning from Climate-Neutral Neighbourhoods: Social Scientific Work in the Living Lab EnStadt:Pfaff — 311**

Martin Eckhard, Torben Stührmann, David Sauss

**22 QUARREE100 – Resilient, Integrated, System-Serving and Sustainable Energy Supply Systems in Existing Urban Quarters in the Context of Regional Structural Processes — 327**

Ilka Hoffmann

**23 Renewable Energy Communities – A New Model for Neighbourhoods? — 343**

Judith Schäfer, Ilka Hoffmann, Christian Buchmüller

**24 Integration of Heat Consumers into Green Heating Networks – Municipal Control Instruments — 359**

Lennart Winkeler, David Unland, Teike Scheepmaker, Katrin Fahrenkrug, Torben Stührmann

**25 Development and Basic Conceptualization of Digital Decision Support Tools to Promote Participation Processes in Energy Transition — 375**

Volker Binding, Wolfgang Braun, Janko Röbisch,

**26 Stochastic Modelling and Economic Analysis of Systems for using Volatile Solar Power — 393**

Benedikt Meyer, Tino Mitzinger, Johannes Röder, Uwe Krien, Heiko Waurisch,  
Reiner Schütt

**27 Resilient Energy System Design of Low Emission Districts – A Model Chain  
from National Scenarios to Plant Operation — 415**

Martin Eckhard, Jana Rasch, Martin Struve, Andreas Wojta

**28 Challenges for Establishing a Municipal Heating Company from a  
Research Project — 435**

Joris Zimmermann, Gunther Gehlert

**29 Design and Integration of Large Heat Pumps for District Heating with  
heterogeneous building structures — 453**

Anne Nieters,

**30 Quantification of Regional Economic Effects through a Sustainable Heat  
Supply of a Neighbourhood — 465**

Jürgen Görres, Simeon Kühl, Melissa Siegl, Heike Erhorn-Kluttig, Katrin Lenz,  
Henner Gimpel, Valerie Graf-Drasch, Annette Roser, Karin Schakib-Ekbatan,  
Anneka Ressel

**31 Presenting the lighthouse of energy transition „STADTQUARTIER  
2050“ — 483**

Johannes Schrade, Micha Illner, Heike Erhorn-Kluttig, Hans Erhorn,

**32 Solutions for Climate-Neutral District Concepts — 505**

Sven Leonhardt, Erik Höhne, Tobias Teich, Mirko Bodach, Pauline Ziegert

**33 ZED (Demonstrating Zwickau's Energy Transition): Innovations and  
Transformation for the Energy Turnaround -Electrical-Thermal Wide Area  
Synchronous Grid as the Basis for Energy-Efficient and Socially Fair  
Quarter Development — 523**

Tobias Härtel, Mario Reichel, Martin Schwind

**34 Thermal Smart Grid for Decentralised Heat Supply in the Quarter — 541**

Shengqing Xiao, Dimitri Nefodov, Markus Richter, Thorsten Urbaneck

**35 Heat-Pump-Based Local District Heating System with Hot Water  
Store — 579**

Daniel Kretz, Tobias Teich, Daniel Franke, Manoël Kraus, Oliver Scharf,  
Sebastian Junghans, Tim Neumann

**36 Interconnection of Smart Homes and Smart Buildings as a Building Block  
of Smart Cities — 595**

Lukas Wechselberger, Benny Gottschalk, Mirko Bodach

**37 Forecast-Based Storage Control at Quarter Level — 611**

Erik Höhne, Michael Schneider, Carolin Alippi, Elisabeth Borbe, Oliver Scharf

**38 User-Centred and Sustainable Local Mobility – A Participatory Approach  
in the Neighbourhood — 623**

**Index — 639**