

1. Record Nr.	UNINA9910677354803321
Titolo	Coordinated operation and planning of modern heat and electricity incorporated networks // edited by Mohammadreza Daneshvar, Behnam Mohammadi-Ivatloo and Kazem Zare
Pubbl/distr/stampa	Piscataway, New Jersey ; ; Hoboken, New Jersey : , : IEEE Press : , : Wiley, , [2023] ©2023
ISBN	1-119-86216-7 1-119-86213-2
Descrizione fisica	1 online resource (547 pages)
Collana	IEEE Press series on power and energy systems
Disciplina	621.31
Soggetti	Electric power systems - Planning Heating from central stations Electric power systems
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Cover -- Title Page -- Copyright Page -- Contents -- Editor Biographies -- List of Contributors -- Preface -- Chapter 1 Overview of Modern Energy Networks -- 1.1 Introduction -- 1.2 Reliability and Resilience of Modern Energy Grids -- 1.3 Renewable Energy Availability in Modern Energy Grids -- 1.4 Modern Multi-Carrier Energy Grids -- 1.5 Challenges and Opportunities of Modern Energy Grids -- 1.6 Summary -- References -- Chapter 2 An Overview of the Transition from One-Dimensional Energy Networks to Multi-Carrier Energy Grids -- Abbreviations -- 2.1 Introduction -- 2.2 Traditional Energy Systems -- 2.2.1 Electricity Grid -- 2.2.2 Gas Grid -- 2.2.3 Heating and Cooling Grid -- 2.3 Background of Multi-Carrier Energy Systems -- 2.3.1 Distributed Energy Resources Background -- 2.3.2 Cogeneration and Trigenation Background -- 2.3.3 Quad Generation -- 2.4 The Definition of Multi-Carrier Energy Grids -- 2.5 Benefits of Multi-Carrier Energy Grids -- 2.6 Challenges of Moving Toward Multi-Carrier Energy Grids -- 2.7 Conclusions -- References -- Chapter 3 Overview of Modern Multi-Dimension Energy Networks -- Nomenclature -- Acronyms -- 3.1 Introduction -- 3.2 Multi-

Dimension Energy Networks -- 3.3 Benefits of MDENs -- 3.3.1 Enhancing System Efficiency -- 3.3.2 Decarbonization -- 3.3.3 Reducing System Operation Cost -- 3.3.4 Improving System Flexibility and Reliability -- 3.4 Moving Toward Modern Multi-Dimension Energy Networks -- 3.4.1 Technology Advancements -- 3.4.2 Policy-Regulatory-Societal Framework -- 3.5 Coordinated Operation of Modern MDENs -- 3.5.1 Technologies -- 3.5.1.1 Enhanced Optimization Tools and Methods -- 3.5.1.2 Improved Forecasting Tools -- 3.5.2 Markets -- 3.5.2.1 Real-time Market Mechanisms -- 3.5.2.2 Peer-to-Peer Market Mechanisms -- 3.6 Coordinated Planning of Modern MDENs.

3.7 Future Plans for Increasing RERs and MDENs -- 3.8 Challenges -- 3.9 Summary -- References -- Chapter 4 Modern Smart Multi-Dimensional Infrastructure Energy Systems - State of the Arts -- Abbreviations -- 4.1 Introduction -- 4.2 Energy Networks -- 4.3 Infrastructure of Modern Multi-Dimensional Energy -- 4.4 Modeling Review -- 4.5 Integrated Energy Management System -- 4.6 Energy Conversion -- 4.7 Economic and Environmental Impact -- 4.8 Future Energy Systems -- 4.9 Conclusion -- References -- Chapter 5 Overview of the Optimal Operation of Heat and Electricity Incorporated Networks -- Abbreviations -- 5.1 Introduction -- 5.2 Integration of Electrical and Heat Energy Systems: The EH Solution -- 5.3 Energy Carriers and Elements of EH -- 5.3.1 Combined Heat and Power Technology -- 5.3.2 Power to Gas Technology -- 5.3.3 Compressed Air Energy Storage Technology -- 5.3.4 Water Desalination Unit -- 5.3.5 Plug-in Hybrid Electric Vehicles -- 5.4 Advantages of the EH System -- 5.4.1 Reliability Improvement -- 5.4.2 Flexibility Improvement -- 5.4.3 Operation Cost Reduction -- 5.4.4 Emissions Mitigation -- 5.5 Applications of the EH System -- 5.5.1 Residential Buildings -- 5.5.2 Commercial Buildings -- 5.5.3 Industrial Factories -- 5.5.4 Agricultural Sector -- 5.6 Challenges and Opportunities -- 5.6.1 Technical Point of View -- 5.6.2 Economic Point of View -- 5.6.3 Environment Point of View -- 5.6.4 Social Point of View -- 5.7 The Role of DSM Programs in the EH System -- 5.7.1 Demand Response Programs -- 5.7.2 Energy Efficiency Programs -- 5.8 Management Methods of the EH System -- 5.9 Conclusion -- References -- Chapter 6 Modern Heat and Electricity Incorporated Networks Targeted by Coordinated Cyberattacks for Congestion and Cascading Outages -- Abbreviations -- 6.1 Introduction -- 6.1.1 Scope of the Chapter. 6.1.2 Literature Review -- 6.1.3 Research Gap and Contributions of This Chapter -- 6.1.4 Organization of the Chapter -- 6.2 Proposed Framework -- 6.2.1 Illustration of the Proposed Framework -- 6.2.2 Assumptions of the Attack Framework -- 6.3 Problem Formulation -- 6.3.1 Objective Functions of the Attack Framework -- 6.3.2 Technical Constraints -- 6.3.2.1 Constraints Related to Bypassing DCSE BDD and ACSE BDD -- 6.3.2.2 Constraints Related to Thermal Units and CHP Units -- 6.3.2.3 Constraints Related to Wind Turbines -- 6.3.2.4 Constraints Related to PV Modules -- 6.3.2.5 Power and Heat Balance Constraints -- 6.3.2.6 Rest of System&rsquo -- s Constraints -- 6.4 Case Study and Simulation Results -- 6.4.1 Utilized Solver -- 6.4.2 Case Study -- 6.4.3 Investigated Scenarios of Cyberattacks -- 6.4.4 Numerical Results and Analysis -- 6.4.4.1 Elaboration of Results Associated with Scenario I -- 6.4.4.2 Elaboration of Results Associated with Scenario II -- 6.4.4.3 Elaboration of Results Associated with Scenario III -- 6.5 Conclusions and Future Work -- References -- Chapter 7 Cooperative Unmanned Aerial Vehicles for Monitoring and Maintenance of Heat and Electricity Incorporated Networks: A Learning-based Approach -- Abbreviations -- 7.1 Introduction -- 7.2

Application of Machine Learning in Power and Energy Networks -- 7.3
Unmanned Aerial Vehicle Applications in Energy and Electricity
Incorporated Networks -- 7.4 Cooperative UAVs for Monitoring and
Maintenance of Heat and Electricity Incorporated Networks: A Learning-
based Approach -- 7.4.1 Network Topology -- 7.4.2 Solar Power
Harvesting Model -- 7.4.3 SUAV's Energy Outage -- 7.4.4 Mission
Success Metric -- 7.4.5 Learning Strategy -- 7.4.6 Convergence
Analysis -- 7.5 Simulation Results -- 7.6 Conclusions -- References.
Chapter 8 Coordinated Operation and Planning of the Modern Heat and
Electricity Incorporated Networks -- Nomenclature -- Abbreviation --
Parameters -- 8.1 Introduction -- 8.2 Literature Review -- 8.3
Optimal Operation and Planning -- 8.3.1 Optimization in Incorporated
Energy Networks -- 8.3.2 Stochastic Modelling -- 8.3.3 Objective
Function -- 8.4 Components and Constraints -- 8.4.1 Combined Heat
and Power by Waste to Energy -- 8.4.2 Photovoltaic -- 8.4.3 Wind
Turbine -- 8.4.4 Ground Source Heat Pump -- 8.4.5 Boiler -- 8.4.6
Heat Storage -- 8.4.7 Heat and Electricity Demand -- 8.5
Incorporated Heat and Electricity Structure -- 8.6 Case Study -- 8.7
Demand Profile -- 8.8 Economic and Environmental Features -- 8.9
Result and Discussion -- 8.10 Conclusion -- References -- Chapter 9
Optimal Coordinated Operation of Heat and Electricity Incorporated
Networks -- Nomenclature -- A. Acronyms -- B. Indices -- C.
Parameters -- D. Variables -- 9.1 Introduction -- 9.2 Heat and
Electricity Incorporated Networks Components and Their Modeling --
9.2.1 Loads/Services -- 9.2.1.1 Electrical Loads -- 9.2.1.2 Thermal
Loads -- 9.2.1.3 Thermal Comfort -- 9.2.2 Equipment -- 9.2.2.1
Resources -- 9.2.2.2 Storages -- 9.2.3 Buildings/Smart Homes --
9.2.4 Heat and Electricity Incorporated Network Operator -- 9.2.5
Different Layers/Networks and Their Connection -- 9.3 Uncertainties
-- 9.4 Optimal Operation of Heat and Electricity Incorporated
Networks -- 9.4.1 Definition of Optimal Operation -- 9.4.2 Different
Goals in Heat and Electricity Incorporated Networks Exploitation --
9.4.3 Different Levels of Heat and Electricity Incorporated Networks
Exploitation -- 9.4.4 Existing Potential of Heat and Electricity
Incorporated Networks for Optimizing Their Operation -- 9.4.4.1
Internal Potential -- 9.4.4.2 External Potential.
9.5 Market/Incentives -- 9.5.1 Energy Markets -- 9.5.2 Ancillary
Services Market -- 9.5.3 Tax/Incentives Impact on Heat and Electricity
Incorporated Networks Operation -- 9.5.4 Offering Strategy -- 9.6
Main Achievements on Heat and Electricity Incorporated Networks
Operation -- 9.7 Conclusions -- References -- Chapter 10 Optimal
Energy Management of a Demand Response Integrated Combined-
Heat-and-Electrical Microgrid -- Nomenclatur -- A. Acronyms -- B.
Sets and Indexes -- C. Parameters -- D. Variables -- 10.1 Introduction
-- 10.2 CHEM Modeling -- 10.2.1 CHEM Structure -- 10.2.2
Modeling for Heat Network -- 10.2.2.1 District Heating Network
Background -- 10.2.2.2 Nodal Flow Balance -- 10.2.2.3 Calculation of
Heat Energy -- 10.2.2.4 Mixing Equation for Temperature -- 10.2.2.5
Heat Dynamics and Loss -- 10.2.3 Indoor Temperature Control --
10.2.4 Price-based Demand Response -- 10.3 Coordinated
Optimization of CHEM -- 10.3.1 Objective Function -- 10.3.2
Operational Constraints -- 10.3.3 Solution Method -- 10.4 Case
Studies -- 10.4.1 Simulation Test Setup -- 10.4.1.1 33-bus CHEM --
10.4.1.2 69-bus CHEM -- 10.4.2 Discussions on Simulation Results
-- 10.4.2.1 33-bus CHEM -- 10.4.2.2 69-bus CHEM -- 10.4.3
Conclusion -- References -- Chapter 11 Optimal Operation of
Residential Heating Systems in Electricity Markets Leveraging Joint
Power-Heat Flexibility -- 11.1 Why Joint Heat-Power Flexibility? --

11.2 Literature Review -- 11.3 Intelligent Heating Systems -- 11.4 Flexibility Potentials of Heating Systems -- 11.5 Heat Controllers -- 11.6 Thermal Dynamics of Buildings -- 11.7 Economic Heat Controller in Dynamic Electricity Market -- 11.7.1 Objective Function of EMPC -- 11.7.2 Case Study of EMPC -- 11.8 Flexible Heat Controller in Uncertain Electricity Market -- 11.8.1 Objective Function of SEMPC -- 11.8.2 First Stage.
11.8.3 Second Stage.
