

## Special Issue On Smart Grid Technologies And Development

**Smart grid (SG), also called intelligent grid, is a modern improvement of the traditional power grid that will revolutionize the way electricity is produced, delivered, and consumed. Studying key concepts such as advanced metering infrastructure, distribution management systems, and energy management systems will support the design of a cost-effective, reliable, and efficient supply system, and will create a real-time bidirectional communication means and information exchange between the consumer and the grid operator of electric power. Optimizing and Measuring Smart Grid Operation and Control is a critical reference source that presents recent research on the operation, control, and optimization of smart grids. Covering topics that include phase measurement units, smart metering, and synchrophasor technologies, this book examines all aspects of modern smart grid measurement and control. It is designed for engineers, researchers, academicians, and students.**

**Energy storage is a main component of any holistic consideration of smart grids, particularly when incorporating power derived from variable, distributed and renewable energy resources. Energy Storage for Smart Grids delves into detailed coverage of the entire spectrum of available and emerging storage technologies, presented in the context of economic and practical considerations. Featuring the latest research findings from the world's foremost energy storage experts, complete with data analysis, field tests, and simulation results, this book helps device manufacturers develop robust business cases for the inclusion of storage in grid applications. It also provides the comparisons and explanations grid planners and operators need to make informed decisions about which storage solutions will be most successful when implemented in operational grids. Connects the latest research findings in energy storage with strategies for economical and practical implementation in grid systems Brings together diverse knowledge resources in one comprehensive volume covering all major storage technologies, explained by experts from the world's leading research institutions Includes detailed data analysis from field tests and simulations to help planners and engineers choose the storage method that will add the most value to their grid operations**

**"First and foremost, both editors acknowledge Elsevier for being given this great opportunity to publish a book on energy storage applications for smart grids. Energy storage is one aspect of smart grid revolution that it is taking place in all areas of electric power systems. Application of advanced storage**

**technologies presents many great opportunities. These include: - Shaving peak demand, which makes more efficient use of the transmission and distribution systems - Facilitating maintenance of aging grid infrastructure and potentially deferring the need for future system improvements - Competitively hedging or reducing energy, capacity and ancillary service costs to load customers (or improving revenues to owners of supply portfolios or storage devices) - Improving environmental performance through the use of quick start low emitting resources - Assisting the successful integration of variable renewable resources by providing load following, frequency control, operating reserves, and voltage support"--**

**Many people think of the Smart Grid as a power distribution group built on advanced smart metering—but that's just one aspect of a much larger and more complex system. The "Smart Grid" requires new technologies throughout energy generation, transmission and distribution, and even the homes and businesses being served by the grid. This also represents new information paths between these new systems and services, all of which represents risk, requiring a more thorough approach to where and how cyber security controls are implemented. This insight provides a detailed architecture of the entire Smart Grid, with recommended cyber security measures for everything from the supply chain to the consumer. Discover the potential of the Smart Grid Learn in depth about its systems See its vulnerabilities and how best to protect it**

**Smart Grid and Enabling Technologies**

**Smart Electricity Distribution Networks**

**Energy Data Analytics for Smart Meter Data**

**Understanding Energy Innovation**

**Research Trends and Challenges in Smart Grids**

Advances in Smart Grid Power System: Network, Control and Security discusses real world problems, solutions, and best practices in real world fields. The book includes executable plans for smart grid systems, their network communications, tactics on protecting information, and plans for cyber incidents. Moreover, it enables researchers and energy professionals to understand the future of energy delivery system security. Covering fundamental theory, mathematical formulations, practical implementations, and experimental testing procedures, this book gives readers invaluable insights into the field of power systems, their quality and reliability, their impact, and their importance in cyber security. Includes supporting illustrations and tables along with valuable end of chapter reference sets Provides a working guideline for the design and analysis of smart grids and their applications Features experimental testing procedures in smart grid power systems, communication network reliability, and cybersecurity

The scientific community and industry have seen tremendous progress in efficient energy production and storage in the last few years. Advancement in technology, new devices require high-performance, stretchable, bendable, and twistable energy sources, which can be integrated into next-generation wearable, compact, and portable electronics for medical, military, and civilian applications. *Smart and Flexible Energy Devices* examines the materials, basic working principles, and state-of-the-art progress of flexible devices like fuel cells, solar cells, batteries, and supercapacitors. Covering the synthesis approaches for advanced energy materials in flexible devices and fabrications and fundamental concepts of flexible energy devices, such as fuel cells, solar cells, batteries, and supercapacitors, top author teams explore how newer materials with advanced properties are used to fabricate the energy devices to meet the future demand for flexible electronics. Additional features include: Addressing the materials, technologies, and challenges of various flexible energy devices under one cover \* Emphasizing the future demands and challenges of the field \* Considering all flexible energy types, such as fuel cells, solar cells, batteries, and supercapacitors \* Suitability for use by undergraduate and postgraduate students of material science and energy programs This is a valuable resource for academics and industry professionals working in the field of energy materials, nanotechnology, and energy devices.

**SMART GRID AND ENABLING TECHNOLOGIES** Discover foundational topics in smart grid technology as well as an exploration of the current and future state of the industry As the relationship between fossil fuel use and climate change becomes ever clearer, the search for reliable, renewable and less harmful sources of energy. Sometimes called the "electronet" or the "energy Internet," smart grids promise to integrate renewable energy, information, and communication technologies with the existing electrical grid and deliver electricity more efficiently and reliably. *Smart Grid and Enabling Technologies* delivers a complete vision of smart grid technology and applications, including foundational and fundamental technologies, the technology that enables smart grids, the current state of the industry, and future trends in smart energy. The book offers readers thorough discussions of modern smart grid technology, including advanced metering infrastructure, net zero energy buildings, and communication, data management, and networks in smart grids. The accomplished authors also discuss critical challenges and barriers in the smart grid industry as well as trends likely to be of importance in its future development. Readers will also benefit from the inclusion of a thorough introduction to smart grid architecture, including traditional grids, the fundamentals of electric power, definitions and classification of smart grids, and the components of smart grid technology An exploration of the opportunities and challenges posed by renewable energy integration Practical discussions of power electronics in the smart grid, including power electronics converters for distributed generation, alternating current transmission systems, and high voltage direct current transmission systems An analysis of distributed generation Power systems for scientists, researchers, engineers, graduate students, and senior undergraduate students studying and working with electrical power systems and communication systems. *Smart Grid and Enabling Technologies* will also earn a place in the libraries of economists, government planners, regulators, policy makers, and energy stakeholders working in the smart grid field.

The book is written as primer hand book for addressing the fundamentals of smart grid. It provides the working definition the functions, design criteria and the tools and techniques and technology needed for building smart grid. The book is needed to provide a working guide for the design, analysis and development of Smart Grid. It incorporates all the essential factors of Smart Grid appropriate for enabling the performance and capability of the power system. There are no comparable books which provide information on the "how to" of the design and analysis. The book provides a fundamental discussion on the motivation for the smart grid development, the working definition and the analysis and development of the Smart Grid. Standards and requirements needed for designing new devices, systems and products are discussed. The automation and computational techniques need to ensure that the Smart Grid guarantees adaptability, foresight alongside capability.

handling new systems and components are discussed. The interoperability of different renewable energy sources are included to ensure will be minimum changes in the existing legacy system. Overall the book evaluates different options of computational intelligence, communication technology and decision support system to design various aspects of Smart Grid. Strategies for demonstration of Smart Grid schemes and associated problems are presented.

Implementing Security Controls into the Modern Power Infrastructure

Nanogrids, Microgrids, and the Internet of Things (IoT)

Fundamentals of Design and Analysis

Planning and Operation for Renewable and Variable Energy Resources (VERs)

Blockchain-Based Smart Grids

**This book provides a thorough treatment of privacy and security issues for researchers in the fields of smart grids, engineering, and computer science. It presents comprehensive insight to understanding the big picture of privacy and security challenges in both physical and information aspects of smart grids. The authors utilize an advanced interdisciplinary approach to address the existing security and privacy issues and propose legitimate countermeasures for each of them in the standpoint of both computing and electrical engineering. The proposed methods are theoretically proofed by mathematical tools and illustrated by real-world examples.**

**This Special Issue “Grid-to-Vehicle (G2V) and Vehicle-to-Grid (V2G) Technologies” was in session from 1 May 2019 to 31 May 2020. For this Special issue, we invited articles on current state-of-the-art technologies and solutions in G2V and V2G, including but not limited to the operation and control of gridable vehicles, energy storage and management systems, charging infrastructure and chargers, EV demand and load forecasting, V2G interfaces and applications, V2G and energy reliability and security, environmental impacts, and economic benefits as well as demonstration projects and case studies in the aforementioned areas. Articles that deal with the latest hot topics in V2G are of particular interest, such as V2G and demand-side response control technique, smart charging infrastructure and grid planning, advanced power electronics for V2G systems, adaptation of V2G systems in the smart grid, adaptation of smart cities for a large number of EVs, integration, and the optimization of V2G systems, utilities and transportation assets for advanced V2G systems, wireless power transfer systems for advanced V2G systems, fault detection, maintenance and diagnostics in V2G processes, communications protocols for V2G systems, energy management system (EMS) in V2G systems, IoT for V2G systems, distributed energy and storage systems for V2G, transportation networks and V2G, energy management for V2G, smart charging/discharging stations for efficient V2G, environmental and socio-economic benefits and challenges of V2G systems, and building integrated V2G systems (BIV2G). Five manuscripts are published in this Special Issue, including “An Ensemble Stochastic Forecasting Framework for Variable Distributed Demand Loads” by Agyeman et al., “Where Will You Park? Predicting Vehicle Locations for**

Vehicle-to-Grid, An MPC Scheme with Enhanced Active Voltage Vector Region for V2G Inverter” by Shipman et al., “Electric Vehicles Energy Management with V2G/G2V Multifactor Optimization of Smart Grids” by Xia et al., and “A Review on Communication Standards and Charging Topologies of V2G and V2H Operation Strategies” by Savitti et al.

Electric power systems are being transformed from older grid systems to smart grids across the globe. The goals of this transition are to address today’s electric power issues, which include reducing carbon footprints, finding alternate sources of decaying fossil fuels, eradicating losses that occur in the current available systems, and introducing the latest information and communication technologies (ICT) for electric grids. The development of smart grid technology is advancing dramatically along with and in reaction to the continued growth of renewable energy technologies (especially wind and solar power), the growing popularity of electric vehicles, and the continuing huge demand for electricity. Smart Grid Systems: Modeling and Control advances the basic understanding of smart grids and focuses on recent technological advancements in the field. This book provides a comprehensive discussion from a number of experts and practitioners and describes the challenges and the future scope of the technologies related to smart grid. Key features: provides an overview of the smart grid, with its needs, benefits, challenges, existing structure, and possible future technologies discusses solar photovoltaic (PV) system modeling and control along with battery storage, an integral part of smart grids discusses control strategies for renewable energy systems, including solar PV, wind, and hybrid systems describes the inverter topologies adopted for integrating renewable power covers the basics of the energy storage system and the need for micro grids describes forecast techniques for renewable energy systems presents the basics and structure of the energy management system in smart grids, including advanced metering, various communication protocols, and the cyber security challenges explores electric vehicle technology and its interaction with smart grids This book is a contribution from the authors, to share solutions for a better and sustainable power grid. Renewable energy, smart grid security and smart energy management are the main topics discussed in this book.

Applied Cyber Security and the Smart Grid

Smart-Grid in IoT-Enabled Spaces

Special Issue on Smart Grid and Energy Internet

Data Privacy for the Smart Grid

Smart Microgrids

*This book covers applied research on smart energy systems, smart grids, smart energy homes, smart energy products and services, and the advanced applications thereof, in the context of demand response and grid interactions. In particular, this book is focused on interdisciplinary research results that combine technical, social, environmental, and economic aspects of smart energy systems and smart energy products. Moreover, several chapters are based*

*on the evaluation of real life cases, energy pilots, prototypes of smart energy products, and end user surveys and interviews.*

*Many Smart Grid books include "privacy" in their title, but only touch on privacy, with most of the discussion focusing on cybersecurity. Filling this knowledge gap, Data Privacy for the Smart Grid provides a clear description of the Smart Grid ecosystem, presents practical guidance about its privacy risks, and details the actions required to prote*

*Smart distribution networks are one of the key research topics of countries looking to modernise electric power networks. Smart Electricity Distributions Networks aims to provide a basic discussion of the smart distribution concept and new technologies related to it, including distributed energy resources (DERs), demand side integration, microgrids, CELL and virtual power plants. With writing from leading contributors in the field of smart distribution networks, this volume discusses different concepts within the field as well as the best methods to analyse smart distribution systems to provide a cohesive overview of issues relating to Smart Grid and related technologies. This book will be valuable to those with an interest in understanding the technologies and performance of smart distribution networks as well as engaging with the wider debate over the future Smart Grid.*

*Successful applications of smart grid Integration of renewable energy sources to smart grid Production of energy using smart grid technologies Hybrid smart grid energy system technologies Novel energy conversion studies in smart grid systems Control techniques for smart grid energy systems Performance analysis of smart grid energy systems under different loads Computational methods and artificial intelligence studies in smart grids Optimized power delivery and generation Self healing Distributed Power Energy Systems and Sources, Renewable Energy, Conventional Power Sources New Trends and Technologies for Smart Grid Policies and Strategies for Smart Grid Microgrids for transportation electrification Energy Transformation from Renewable Energy System to Smart Grid HVDC for Smart Grid Power Devices and Driving Circuits for Smart Grid Decision Support Systems for Smart Grid ICT, IoT, Real time monitoring and control Applications for Industries Smart Grid for Electrical Vehicles, components Practical Guidance for Defining a Smart Grid Modernization Strategy*

*Optimizing and Measuring Smart Grid Operation and Control*

*Smart Grids: Security and Privacy Issues*

*Learning from Smart Grid Experiments*

*Power Electronics in Renewable Energy Systems and Smart Grid*

Blockchain-Based Smart Grids presents emerging applications of blockchain in electrical system and looks to future developments in the use of blockchain technology in the energy market. Rapid growth of renewable energy resources in power systems and significant developments in the telecommunication systems has resulted in new market designs being employed to cover unpredictable and distributed generation of electricity. This book considers the marriage of blockchain and grid modernization, and discusses the transaction shifts in smart grids, from centralized to peer-to-peer structures. In addition, it addresses the effective application of these structures to speed up processes, resulting in more flexible electricity systems. Aimed at moving towards blockchain-based smart grids with renewable applications, this book is useful to researchers and practitioners in all sectors of smart grids, including renewable energy providers, manufacturers and professionals involved in electricity generation from renewable sources, grid modernization and smart grid applications. Considers the current challenges facing smart grids and presents solutions on how blockchain technology could counter these issues Incorporates detailed applications of blockchain in smart grids based on dynamic research and developments Includes models, algorithms, and frameworks to practically demonstrate the uses of blockchain technology Written by a global group of authors for worldwide coverage

This Special Issue “Evaluation of Energy Efficiency and Flexibility in Smart Buildings” addresses the relevant role of buildings as strategic instruments to improve the efficiency and flexibility of the overall energy system. This role of the built environment is not yet fully developed and exploited and the book content contributes to increasing the general awareness of achievable benefits. In particular, different topics are discussed, such as optimal control, innovative efficient technologies, methodological approaches, and country analysis about energy efficiency and energy flexibility potential of the built environment. The Special Issue offers valuable insights into the most recent research developments worldwide.

Driven by new regulations, new market structures, and new energy resources, the smart grid has been the trigger for profound changes in the way that electricity is generated, distributed, managed, and consumed. The smart grid has raised the traditional power grid by using a two-way electricity and information flow to create an advanced, automated power supply network. However, these pioneering smart grid technologies must grow to adapt to the demands of the current digital society. In today’s digital landscape, we can access feasible data and knowledge that were merely inconceivable. This Special Issue aims to address the landscape in which smart grids are progressing, due to the advent of pervasive technologies like the Internet of Things (IoT). It will be the advanced exploitation of the massive amounts of data generated from (low-cost) IoT sensors that will become the main driver to evolve the concept of the smart grid, currently focused on infrastructure, towards the digital energy network paradigm, focused on service. Furthermore, collective intelligence will improve the processes of decision making and empower citizens. Original manuscripts focusing on state-of-the-art IoT networking and communications, M2M communications, cyberphysical system architectures, big data analytics or cloud computing applied to digital energy platforms, including design methodologies and practical implementation aspects, are welcome.

This book introduces the most promising enabling technologies and methodologies for smart grids. It not only focuses on technological breakthroughs and roadmaps in implementing these technologies, but also presents the much-needed sharing of best practices, demonstrating the potential role of smart grid functions in improving the technical, economic, and environmental performance of modern power distribution systems. This can be achieved by allowing for massive pervasion of dispersed generating units, increasing the hosting capacity of renewable power generators, reducing active power losses and atmospheric emissions, and improving system flexibility.

Towards the Digital Energy Network

Evaluation of Energy Efficiency and Flexibility in Smart Buildings

Smart Grid Analytics for Sustainability and Urbanization

2021 9th International Conference on Smart Grid (icSmartGrid)

*Smart grids are for everyone but require the vision and investment plans for grid modernization. This document provides some practical elements on how to develop a smart grid vision and investment plan with a focus on the distribution side and also briefly discusses finance and regulatory issues.*

*The writing of this book was largely motivated by the ongoing unprecedented world-wide restructuring of the power industry. This*

*move away from the traditional monopolies and toward greater competition, in the form of increased numbers of independent power producers and an unbundling of the main services that were until now provided by the utilities, has been building up for over a decade. This change was driven by the large disparities in electricity tariffs across regions, by technological developments that make it possible for small producers to compete with large ones, and by a widely held belief that competition will be beneficial in a broad sense. All of this together with the political will to push through the necessary legislative reforms has created a climate conducive to restructuring in the electric power industry. Consequently, since the beginning of this decade dramatic changes have taken place in an ever-increasing list of nations, from the pioneering moves in the United Kingdom, Chile and Scandinavia, to today's highly fluid power industry throughout North and South America, as well as in the European Community. The drive to restructure and take advantage of the potential economic benefits has, in our view, forced the industry to take actions and make choices at a hurried pace, without the usual deliberation and thorough analysis of possible implications. We must admit that to speak of "the industry" at this juncture is perhaps disingenuous, even misleading.*

*This book addresses the need to understand the development, use, construction, and operation of smart microgrids (SMG). Covering selected major operations of SMG like dynamic energy management, demand response, and demand dispatch, it describes the design and operational challenges of different microgrids and provides feasible solutions for systems. Smart Micro Grid presents communication technologies and governing standards used in developing communication networks for realizing various smart services and applications in microgrids. An architecture facilitating bidirectional communication for smart distribution/microgrid is brought out covering aspects of its design, development and validation. The book is aimed at graduate, research students and professionals in power, power systems, and power electronics. Features:*

- Covers a broad overview of the benefits, the design and operation requirements, standards and communication requirements for deploying microgrids in distribution systems.*
- Explores issues related to planning, expansion, operation, type of microgrids, interaction among microgrid and distribution networks, demand response, and the technical requirements for the communication network.*
- Discusses current standards and common practices to develop and operate microgrids.*
- Describes technical issues and requirements for operating microgrids.*
- Illustrates smart communication architecture and protocols.*

*The comprehensive and authoritative guide to power electronics in renewable energy systems Power electronics plays a significant role in modern industrial automation and high- efficiency energy systems. With contributions from an international group of noted experts, Power Electronics in Renewable Energy Systems and Smart Grid: Technology and Applications offers a comprehensive review of the technology and applications of power electronics in renewable energy systems and smart grids. The authors cover information on a variety of energy systems including wind, solar, ocean, and geothermal energy systems as well as fuel cell systems and bulk energy storage systems. They also examine smart grid elements, modeling, simulation, control, and AI applications. The*

*book's twelve chapters offer an application-oriented and tutorial viewpoint and also contain technology status review. In addition, the book contains illustrative examples of applications and discussions of future perspectives. This important resource: Includes descriptions of power semiconductor devices, two level and multilevel converters, HVDC systems, FACTS, and more Offers discussions on various energy systems such as wind, solar, ocean, and geothermal energy systems, and also fuel cell systems and bulk energy storage systems Explores smart grid elements, modeling, simulation, control, and AI applications Contains state-of-the-art technologies and future perspectives Provides the expertise of international authorities in the field Written for graduate students, professors in power electronics, and industry engineers, Power Electronics in Renewable Energy Systems and Smart Grid: Technology and Applications offers an up-to-date guide to technology and applications of a wide-range of power electronics in energy systems and smart grids.*

*Research Anthology on Smart Grid and Microgrid Development*

*Future Smart Grid Systems*

*Special Issue on Cybersecurity and Interconnection Networks: Smart Grid, Smart Phone, and Smart-ID*

*Advanced Applications for Smart Energy Systems Considering Grid-Interactive Demand Response*

*Engineering and Economics*

Energy efficiency and low-carbon technologies are key contributors to curtailing the emission of greenhouse gases that continue to cause global warming. The efforts to reduce greenhouse gas emissions also strongly affect electrical power systems. Renewable sources, storage systems, and flexible loads provide new system controls, but power system operators and utilities have to deal with their fluctuating nature, limited storage capabilities, and typically higher infrastructure complexity with a growing number of heterogeneous components. In addition to the technological change of new components, the liberalization of energy markets and new regulatory rules bring contextual change that necessitates the restructuring of the design and operation of future energy systems. Sophisticated component design methods, intelligent information and communication architectures, automation and control concepts, new and advanced markets, as well as proper standards are necessary in order to manage the higher complexity of such intelligent power systems that form smart grids. Due to the considerably higher complexity of such cyber-physical energy systems, constituting the power system, automation, protection, information and communication technology (ICT), and system services, it is expected that the design and validation of smart-grid configurations will play a major role in future technology and system developments. However, an integrated approach for the design and evaluation of smart-grid configurations incorporating these diverse constituent parts remains evasive. The currently available validation approaches focus mainly on component-oriented methods. In order to guarantee a sustainable, affordable, and secure supply of electricity through the transition to a future smart grid with considerably higher complexity and innovation, new design, validation, and testing methods appropriate for cyber-physical systems are required. Therefore,

this book summarizes recent research results and developments related to the design and validation of smart grid systems. Sustainable Networks in Smart Grid presents global challenges in smart metering with renewable energy resources, micro-grid design, communication technologies, big data, privacy and security in the smart grid. Providing an overview of different available PLC technologies and configurations and their applications in different sectors, this book provides case studies and practical implementation details of smart grid technology, paying special attention to Advanced Metering Infrastructure (AMI) scenarios with the presence of Distribution Grid (DG) and Electric Vehicles (EV). Covering regulatory policies for energy storage, management strategies for microgrid operation, and key performance indicators for smart grid development, this reference compiles up-to-date information on different aspects of the Internet of Smart Metering. In addition, innovative contributions on Data Analytics, Energy Theft Detection, Data-Driven Framework, Blockchain-IoT-enabled Sensor Networks, and Smart Contacts in the Blockchain are also included. Includes case studies and practical implementation examples of different smart grid applications, their benefits, characteristics and requirements Provides a SWOT analysis of the impact of recent regulatory changes on the business case for energy storage (ES) Presents a comprehensive survey of privacy-preserving schemes for smart grid communications

Smart Energy Management for Smart Grids MDPI

"This reference book covers the latest innovations and trends within smart grid and microgrid development, detailing benefits, challenges, and opportunities, that will help readers to fully understand the current opportunities that smart grids and microgrids present around the world"--

Technology and Applications

Sustainable Networks in Smart Grid

Energy Storage for Smart Grids

Hybrid Renewable Energy Systems

Grid-to-Vehicle (G2V) and Vehicle-to-Grid (V2G) Technologies

*Internet of Things (IoT)-enabled spaces have made revolutionary advances in the utility grid. Among these advances, intelligent and energy-efficient services are gaining considerable interest. The use of the smart grid is increasing day after day around us and is not only used in saving energy but also in our daily life for intelligent health, traffic, and even farming systems. The grid enabled with IoT features is also expected to communicate with cellular networks smoothly in the next-generation networks (6G and beyond). This will open the door for other interesting research areas. In this book, we consider the most significant and emergent research topics in this domain, addressing major issues and challenges in IoT-based solutions proposed for the smart grid. The chapters provide insight on comprehensive topics in IoT-based smart grids, combining technical aspects with the most up-to-date theory. It investigates the grid under varying and potential emerging paradigms such as edge/fog computing, in addition to big*

*data aspects considerations in the IoT era. With comprehensive surveys and case studies, this book explores basic and high-level grid aspects in the emerging smart city paradigm, which makes it especially attractive to researchers, academics, and higher-level students. This authored book can be used by computer science undergraduate and postgraduate students, researchers and practitioners, city administrators, policymakers, and government regulators.*

*This book focuses on the analysis, design and implementation of future smart grid systems. This book contains eleven chapters, which were originally published after rigorous peer-review as a Special Issue in the International Journal of Energies (Basel). The chapters cover a range of work from authors across the globe and present both the state-of-the-art and emerging paradigms across a range of topics including sustainability planning, regulations and policy, estimation and situational awareness, energy forecasting, control and optimization and decentralisation. This book will be of interest to researchers, practitioners and scholars working in areas related to future smart grid systems.*

*Security and privacy protection within computer networks can be a challenge. By examining the current problems and challenges this domain is facing, more efficient strategies can be established to safeguard personal information against invasive pressures. Security and Privacy in Smart Sensor Networks is a critical scholarly resource that examines recent developments and emerging trends in smart sensor security and privacy by providing new models, practical solutions, and technological advances related to security. Featuring coverage on a broad range of topics such as cloud security, encryption, and intrusion detection systems, this book is geared towards academicians, engineers, IT specialists, researchers, and students seeking current research on authentication and intrusion detection.*

*Information and communication technologies play an essential role in the effectiveness and efficiency of smart city processes. Recognizing the role of process analysis in energy usage and how it can be enhanced is essential to improving city sustainability. Smart Grid Analytics for Sustainability and Urbanization provides emerging research on the development of information technology and communication systems in smart cities and smart grids. While highlighting topics such as process mining, innovation management, and sustainability optimization, this publication explores technology development and the mobilization of different environments in smart cities. This book is an important resource for graduate students, researchers, academics, engineers, and government officials seeking current research on how process analysis in energy usage is manifested and how it can be enhanced.*

*Advances in Smart Grid Power System*

*Power Systems Restructuring*

*Smart and Flexible Energy Devices*

*Modeling and Control*

*Security and Privacy in Smart Sensor Networks*

*The principal advantage of smart electricity meters is their ability to transfer digitized electricity consumption data to remote processing systems. The data collected by these devices make the realization of many novel use cases possible, providing benefits to electricity providers and customers alike. This book includes 14 research articles that explore and exploit the information content of smart meter data, and provides insights into the realization of new digital solutions and services that support the transition towards a sustainable energy system. This volume has been edited by Andreas Reinhardt, head of the Energy Informatics research group at Technische Universität Clausthal, Germany, and Lucas Pereira, research fellow at Técnico Lisboa, Portugal.*

*This book is an advanced approach to power electronics specifically in terms of renewable energy systems and smart grid. The fourteen chapters are updated and extended versions of the invited papers in the Proc. IEEE special issue of November 2017, contributed by a group of invited authors who are international authorities in their field. The application-oriented chapters are tutorial oriented, with technology status review. The book also includes examples of applications and discussions of future perspectives.*

*Blockchain-Based Smart Grids presents emerging applications of blockchain in electrical system and looks to future developments in the use of blockchain technology in the energy market. Rapid growth of renewable energy resources in power systems and significant developments in the telecommunication systems has resulted in new market designs being employed to cover unpredictable and distributed generation of electricity. This book considers the marriage of blockchain and grid modernization, and discusses the transaction shifts in smart grids, from centralized to peer-to-peer structures. In addition, it addresses the effective application of these structures to speed up processes, resulting in more flexible electricity systems. Aimed at moving towards blockchain-based smart grids with renewable applications, this book is useful to researchers and practitioners in all sectors of smart grids, including renewable energy providers, manufacturers and professionals involved in electricity generation from renewable sources, grid modernization and smart grid applications.*

*The energy scene in the world is a complex picture of a variety of energy sources being used to meet the world's growing energy needs. There is, however, a gap in the demand and supply. It is recognized that decentralized power generation based on the various renewable energy technologies can, to some extent, help in meeting the growing energy needs. The renewable energy landscape has witnessed tremendous changes in the policy framework with accelerated and ambitious plans to increase the contribution of renewable energy such as solar, wind, bio-power, and others. Hybrid renewable energy systems are important for continuous operation and supplements each form of energy seasonally, offering several benefits over a stand-alone system. It can enhance capacity and lead to greater security of continuous electricity supply, among other applications. This book provides a platform for researchers, academics, industry professionals, consultants and designers to discover state-of-the-art developments and challenges in the field of hybrid renewable energy. Written by a team of experts and edited by one of the top researchers in hybrid renewable systems, this volume is a must-have for any engineer, scientist, or student working in this field, providing a valuable reference and guide in a quickly emerging field.*

*The Road to Intelligence in Power*

*The Case of Distribution*

*Smart Grid Systems*

*Special Issue: Smart Grid and Emerging Technology Integration*

*Network, Control and Security*