Special Issue On Smart Grid Technologies And Development

Power Electronics and Motor Drives

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.

Handbook of Research on Smart Power System Operation and Control

Electricity is the lifeblood of modern society, and for the vast majority of people that electricity is obtained from large, interconnected power grids. However, the grid that was developed in the 20th century, and the incremental improvements made since then, including its underlying analytic foundations, is no longer adequate to completely meet the needs of the 21st century. The next-generation electric grid must be more flexible and resilient. While fossil fuels will have their place for decades to come, the grid of the future will need to accommodate a wider mix of more intermittent generating sources such as wind and distributed solar photovoltaics. Achieving this grid of the future will require effort on several fronts. There is a need for continued shorter-term engineering research and development, building on the existing analytic foundations for the grid. But there is also a need for more fundamental research to expand these analytic foundations. Analytic Research Foundations for the Next-Generation Electric Grid provide guidance on the longer-term critical areas for research in mathematical and computational sciences that is needed for the next-generation grid. It offers recommendations that are designed to help direct future research as the grid evolves and to give the nation’s research and development infrastructure the tools it needs to effectively develop, test, and use this research.
**Read Free Special Issue On Smart Grid Technologies And Development**

Comparison by both Transitions at Half Bit Rate (Antonio D Reis, Jose F Rocha, Atilio S Gameiro and Jose P Carvalho) Models of Organizational Change for Modernizing Pollution Warning Services (Anca Daniela Ionita and Mariana Mocanu) 

Readership: Professionals, academics and graduate students in electrical & electronic engineering, computer engineering, industrial engineering and mathematics. Key Features: This volume contains revised and extended research articles written by prominent researchers participating in the conferences. The book offers the state of art of tremendous advances in engineering sciences. The book can also serve as an excellent reference work for researchers and graduate students working with/on engineering sciences.

Keywords: Engineering Mathematics; Computer Science; Electrical Engineering; Manufacturing Engineering; Industrial Engineering; Industrial Applications

**Security and Privacy in Smart Grid**

**IAENG Transactions on Engineering Sciences**

Power Electronics and Motor Drives: Advances and Trends, Second Edition is the perfect resource to keep the electrical engineer up-to-speed on the latest advancements in technologies, equipment and applications. Carefully structured to include both traditional topics for entry-level and more advanced applications for the experienced engineer, this reference sheds light on the rapidly growing field of power electronic operations. New content covers converters, machine models and new control methods such as fuzzy logic and neural network control. This reference will help engineers further understand recent technologies and gain practical understanding with its inclusion of many industrial applications. Further supported by a glossary per chapter, this book gives engineers and researchers a critical reference to learn from real-world examples and make future decisions on power electronic technology and applications. Provides many practical examples of industrial applications. Updates on the newest electronic topics with content added on fuzzy logic and neural networks. Presents information from an expert with decades of research and industrial experience.

**Intelligent Control in Energy Systems**

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.

**Advances in Smart Grid Power System**

With the increasing worldwide trend in population migration into urban centers, we are beginning to see the emergence of the kinds of mega-cities which were once the stuff of science fiction. It is clear to most urban planners and developers that accommodating the needs of the tens of millions of inhabitants of those megalopolises in an orderly and uninterrupted manner will require the seamless integration of and real-time monitoring and response services for public utilities and transportation systems. Part speculative look into the future of the world’s urban centers, part technical blueprint, this visionary book helps lay the groundwork for the communication networks and services on which tomorrow’s “smart cities” will run. Written by a uniquely well-qualified
author team, this book provides detailed insights into the technical requirements for the wireless sensor and actuator networks required to make smart cities a reality.

**Blockchain-Based Smart Grids**

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.

**Smart Grid Systems**

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.

**Smart Grids**

The latest edition features a new chapter on implementation and operation of an integrated smart grid with updates to multiple chapters throughout the text. New sections on Internet of things, and how they relate to smart grids and smart cities, have also been added to the book. It describes the impetus for change in the electric utility industry and discusses the business drivers, benefits, and market outlook of the smart grid initiative. The book identifies the technical framework of enabling technologies and smart solutions and describes the role of technology developments and coordinated standards in smart grid, including various initiatives and organizations helping to drive the smart grid effort. With chapters written by leading experts in the field, the text explains
how to plan, integrate, implement, and operate a smart grid.

**Next Generation Internet of Things**

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.

**Analytic Research Foundations for the Next-Generation Electric Grid**

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 inverted 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.

**Power Electronics in Renewable Energy Systems and Smart Grid**

This one-stop reference provides the state-of-the-art theory, key strategies, protocols, deployment aspects, standardization activities and experimental studies of communication and networking technologies for the smart grid. Expert authors provide all the essential information researchers need to progress in the field and to allow power systems engineers to optimize their communication systems.

**The Smart Grid**
**Power System Protection in Smart Grid Environment**

Practical Guidance for Defining a Smart Grid Modernization Strategy: The Case of Distribution guides stakeholders on how utilities can define their own smart grid vision, identify priorities, and structure investment plans. While most of these strategic aspects apply to any area of the electricity grid, the book focuses on distribution. The guidance includes key building blocks for modernizing the distribution grid and provides examples of grid modernization projects. This revised edition also includes key communication system requirements to support a well-functioning grid. The concept of the smart grid is relevant to all grids. What varies are the magnitude and type of the incremental steps toward modernization for achieving a specific smart grid vision. A utility that is at a relatively low level of grid modernization may leapfrog one or more levels of modernization to achieve some of the benefits of the highest levels of grid modernization. Smart grids impact electric distribution systems significantly. In developing countries, modernizing the distribution grid promises to benefit the operation of electric distribution utilities in many and various ways. These benefits include improved operational efficiency (such as reduced losses and lower energy consumption), reduced peak demand, improved service reliability, and ability to accommodate distributed generating resources without adversely impacting overall power quality. Practical Guidance for Defining a Smart Grid Modernization Strategy concludes by describing funding and regulatory issues that may need to be taken into account when developing smart grid plans. The World Bank Studies series is available for free download online through the Open Knowledge Repository (https://openknowledge.worldbank.org).

**Power Electronics in Renewable Energy Systems and Smart Grid**

In recent years, the development of advanced structures for providing sustainable energy has been a topic at the forefront of public and political conversation. Many are looking for advancements on pre-existing sources and new and viable energy options to maintain a modern lifestyle. The Handbook of Research on Power and Energy System Optimization is a critical scholarly resource that examines the usage of energy in relation to the perceived standard of living within a country and explores the importance of energy structure augmentation. Featuring coverage on a wide range of topics including energy management, micro-grid, and distribution generation, this publication is targeted towards researchers, academicians, and students seeking relevant research on the augmentation of current energy structures to support existing standards of living.

**New Technologies for Smart Grid Operation**

Presenting an optimal energy distribution strategy for microgrids in a smart grid environment, and featuring a detailed analysis of the mathematical techniques of convex optimization and online algorithms, this book provides readers with essential content on how to achieve multi-objective optimization that takes into consideration power subscribers, energy providers and grid smoothing in microgrids. Featuring detailed theoretical proofs and simulation results that demonstrate and evaluate the correctness and effectiveness of the algorithm, this text explains step-by-step how the problem can be reformulated and solved, and how to achieve the distributed online algorithm on the basis of a centralized offline algorithm. Special attention is paid to how to apply this algorithm in practical cases and the possible future trends of the microgrid and smart grid research and applications. Offering a valuable guide to help researchers and students better understand the new smart grid, this book will also familiarize readers with the concept of the microgrid and its relationship with renewable energy.

**Energy Storage Systems and Power Conversion Electronics for E-Transportation and Smart Grid**

Advances in Smart Grid Power System: Network, Control and Security discusses real world problems, solutions, and best practices in related fields. The
book includes executable plans for smart grid systems, their network communications, tactics on protecting information, and response plans for cyber incidents. Moreover, it enables researchers and energy professionals to understand the future of energy delivery systems and 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 cybersecurity. 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 networks, reliability, and cybersecurity

Smart Grid Communications and Networking

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

Special Issue on Communications and Networking for the Smart Grid

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

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.

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

This is a reprint in book form of the Energies MDPI Journal Special Issue, entitled “Energy Storage Systems and Power Conversion Electronics for E-Transportation and Smart Grid”. The Special Issue was managed by two Guest Editors from Italy and Norway: Professor Sergio Saponara from the University of Pisa and Professor Lucian MIHET-POPA from Østfold University College, in close cooperation with the Editors from Energies. The papers published in this SI are related to the emerging trends in energy storage and power conversion electronic circuits and systems, with a specific focus on transportation electrification, and on the evolution from the electric grid to a smart grid. An extensive exploitation of renewable energy sources is foreseen for the smart grid, as well as a close integration with the energy storage and recharging systems of the electrified transportation era. Innovations at the levels of both algorithmic and hardware (i.e., power converters, electric drives, electronic control units (ECU), energy storage modules and charging stations) are proposed. Research and technology transfer activities in energy storage systems, such as batteries and super/ultra-capacitors, are essential for the success of electric transportation, and to foster the use of renewable energy sources. Energy storage systems are the key technology to solve these issues, and to increase the
adoption of renewable energy sources in the grid.

**Transportation and Power Grid in Smart Cities**

Energy storage systems have been recognized as viable solutions for implementing the smart grid paradigm, but have created challenges in terms of load levelling, integrating renewable and intermittent sources, voltage and frequency regulation, grid resiliency, improving power quality and reliability, reducing energy import during peak demand periods, and so on. In particular, distributed energy storage addresses a wide range of the above potential issues, and it is gaining attention from customers, utilities, and regulators. Distributed energy storage has considerable potential for reducing costs and improving the quality of electric services. However, installation costs and lifespan are the main drawbacks to the wide diffusion of this technology. In this context, a serious challenge is the adoption of new techniques and strategies for the optimal planning, control, and management of grids that include distributed energy storage devices. Regulatory guidance and proactive policies are urgently needed to ensure a smooth rollout of this technology. This book collects recent contributions of methodologies applied to the integration of distributed energy storage devices in smart power systems. Several areas of research (optimal siting and sizing of energy storage systems, adaption of energy storage systems to load leveling and harmonic compensation, integration for electric vehicles, and optimal control systems) are investigated in the contributions collected in this book.

**Smart Grid as a Solution for Renewable and Efficient Energy**

Because society depends greatly on electric energy, power system control and protection focuses on ensuring a secure and reliable supply of power. To operate the electric systems in safe mode, the power system component should be equipped with intelligent controllers. The Handbook of Research on Smart Power System Operation and Control is a collection of innovative research on the theoretical and practical developments in smart power system operation and control that takes into account both smart grid and micro-grid systems. While highlighting topics including cybersecurity, smart grid, and wide area monitoring, this book is ideally designed for researchers, students, and industry professionals.

**Towards Excellence in Engineering Education**

With distributed generation interconnection power flow becoming bidirectional, culminating in network problems, smart grids aid in electricity generation, transmission, substations, distribution and consumption to achieve a system that is clean, safe (protected), secure, reliable, efficient, and sustainable. This book illustrates fault analysis, fuses, circuit breakers, instrument transformers, relay technology, transmission lines protection setting using DIGSILENT Power Factory. Intended audience is senior undergraduate and graduate students, and researchers in power systems, transmission and distribution, protection system broadly under electrical engineering.

**Smart Electricity Distribution Networks**

**Distributed Energy Storage Devices in Smart Grids**

Acquiring knowledge is a life-long process; we constantly need to keep abreast of developments and progress in science and other disciplines. Embracing a scholarship of teaching and learning (SoTL) means practicing constant self-reflection, involving evaluation of the academic career and the ways in which strategies are designed to examine, interpret, and share learning about teaching. This practice not only yields benefits to the lecturer but also enriches the
scholarly community in the discipline. In general, SoTL is regarded as a vibrant practice of ongoing self-criticism and sharing, which results in accumulated teaching experiences for teachers, students, and the teaching community at large. This book is a contribution from authors sharing their experiences, how their teaching portfolios reflect their personal development as teachers, and how their teaching experiences are embedded in the scholarship of teaching and learning.

**Practical Guidance for Defining a Smart Grid Modernization Strategy**

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.

**Special Issue on Smart Grid and Energy Internet**

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.

**Distributed Energy Resources Management 2018**

This SpringerBrief addresses the main security concerns for smart grid, e.g., the privacy of electricity consumers, the exchanged messages integrity and confidentiality, the authenticity of participated parties, and the false data injection attacks. Moreover, the authors demonstrate in detail the various proposed techniques to secure the smart grid’s different communication networks and preserve the privacy of the involved. Over many years, power grid has generated electricity from central generators and distributed it in one direction from the generation stations to end-users; also, information is one directional so that the grid’s control center doesn’t get enough information about customers’ requirements and consequently can’t prevent electricity losses. So, the electricity grid is merged with information and communication technology to form smart grid. The main target of this incorporation is to connect different parties of power grid to exchange information about grid conditions and customers’ requirements, and consequently, improve the reliability and efficiency of electricity generation and distribution. That upgrade of the power grid exposes it to the cyber security threats that the communication networks suffer from, such as malicious attacks to forge the electricity consumption readings or price, extract personal information for residential consumers, such as daily habits and life style, or attack some grid’s resources and equipment availability using denial-of-service attacks. Also, novel threats are introduced in smart grid due to the power grid nature, such as false data injection attack, in which the adversary compromises several measurement units and injects false information about the grid conditions that mislead the grid’s control center to make wrong decisions for the grid and consequently impact on its stability and efficiency.

**Methods and Concepts for Designing and Validating Smart Grid Systems**

**Smart Microgrids**
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.

**Intelligent Paradigms for Smart Grid and Renewable Energy Systems**

The Special Issue Distributed Energy Resources Management 2018 includes 13 papers, and is a continuation of the Special Issue Distributed Energy Resources Management. The success of the previous edition shows the unquestionable relevance of distributed energy resources in the operation of power and energy systems at both the distribution level and at the wider power system level. Improving the management of distributed energy resources makes it possible to accommodate the higher penetration of intermittent distributed generation and electric vehicle charging. Demand response programs, namely the ones with a distributed nature, allow the consumers to contribute to the increased system efficiency while receiving benefits. This book addresses the management of distributed energy resources, with a focus on methods and techniques to achieve an optimized operation, in order to aggregate the resources namely in the scope of virtual power players and other types of aggregators, and to remunerate them. The integration of distributed resources in electricity markets is also addressed as an enabler for their increased and efficient use.

**IAENG Transactions on Engineering Sciences**

**Online Algorithms for Optimal Energy Distribution in Microgrids**

This book provides an overview of the next generation Internet of Things (IoT), ranging from research, innovation, development priorities, to enabling technologies in a global context. It is intended as a standalone in a series covering the activities of the Internet of Things European Research Cluster (IERC), including research, technological innovation, validation, and deployment. The text builds on the ideas put forward by the European Research Cluster, the IoT European Platform Initiative (IoT-EPI), the IoT European Large-Scale Pilots Programme and the IoT European Security and Privacy Projects, presenting global views and state-of-the-art results regarding the next generation of IoT research, innovation, development, and deployment. The IoT and Industrial Internet of Things (IIoT) are evolving towards the next generation of Tactile IoT/IIoT, bringing together hyperconnectivity (5G and beyond), edge computing, Distributed Ledger Technologies (DLTs), virtual and augmented reality (VR/AR), and AI transformation. Following the wider adoption of consumer IoT, the next generation of IoT/IIoT innovation for business is driven by industries, addressing interoperability issues and providing new end-to-end security solutions to face continuous treats. The advances of AI technology in vision, speech recognition, natural language processing and dialog are enabling the development of end-to-end intelligent systems encapsulating multiple technologies, delivering services in real-time using limited resources. These developments are focusing on designing and delivering embedded and hierarchical AI solutions in IoT/IIoT, edge computing, using distributed architectures, DLTs platforms and distributed end-to-end security, which provide real-time decisions using less data and computational resources, while accessing each type of resource in a way that enhances the accuracy and performance of models in the various IoT/IIoT applications. The convergence and combination of IoT, AI and other
related technologies to derive insights, decisions and revenue from sensor data provide new business models and sources of monetization. Meanwhile, scalable, IoT-enabled applications have become part of larger business objectives, enabling digital transformation with a focus on new services and applications. Serving the next generation of Tactile IoT/IIoT real-time use cases over 5G and Network Slicing technology is essential for consumer and industrial applications and support reducing operational costs, increasing efficiency and leveraging additional capabilities for real-time autonomous systems. New IoT distributed architectures, combined with system-level architectures for edge/fog computing, are evolving IoT platforms, including AI and DLTs, with embedded intelligence into the hyperconnectivity infrastructure. The next generation of IoT/IIoT technologies are highly transformational, enabling innovation at scale, and autonomous decision-making in various application domains such as healthcare, smart homes, smart buildings, smart cities, energy, agriculture, transportation and autonomous vehicles, the military, logistics and supply chain, retail and wholesale, manufacturing, mining and oil and gas.

Handbook of Research on Power and Energy System Optimization

The power system has often been cited as the greatest and most complex machine ever built, yet it is predominantly a mechanical system. Technologies and intelligent systems are now available that can significantly enhance the overall functionality of power distribution and make it ready to meet the needs of the 21st century. This book explains how sensors, communications technologies, computational ability, control, and feedback mechanisms can be effectively combined to create this new, continually adjusting "smart grid" system. It provides an understanding of both IntelliGridSM architecture and EnergyPortSM as well as how to integrate intelligent systems to achieve the goals of reliability, cost containment, energy efficiency in power production and delivery, and end-use energy efficiency.

Smart Energy Management for Smart Grids

As the need for proficient power resources continues to grow, it is becoming increasingly important to implement new strategies and technologies in energy distribution to meet consumption needs. The employment of smart grid networks assists in the efficient allocation of energy resources. Smart Grid as a Solution for Renewable and Efficient Energy features emergent research and trends in energy consumption and management, as well as communication techniques utilized to monitor power transmission and usage. Emphasizing developments and challenges occurring in the field, this book is a critical resource for researchers and students concerned with signal processing, power demand management, energy storage procedures, and control techniques within smart grid networks.

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

Global energy context has become more and more complex in the last decades; the raising prices of fuels together with economic crisis, new international environmental and energy policies that are forcing companies. Nowadays, as we approach the problem of global warming and climate changes, smart metering technology has an effective use and is crucial for reaching the 2020 energy efficiency and renewable energy targets as a future for smart grids. The environmental targets are modifying the shape of the electricity sectors in the next century. The smart technologies and demand side management are the key features of the future of the electricity sectors. The target challenges are coupling the innovative smart metering services with the smart meters technologies, and the consumers’ behaviour should interact with new technologies and polices. The book looks for the future of the electricity demand and the challenges posed by climate changes by using the smart meters technologies and smart meters services. The book is written by leaders from academia and industry experts who are handling the smart meters technologies, infrastructure, protocols, economics, policies and regulations. It provides a promising aspect of the future of the electricity demand. This book is intended for academics and engineers who are working in universities, research institutes, utilities and industry sectors wishing to enhance their idea and get new information about the smart meters.
**Smart Metering Technology and Services**

The editors of this Special Issue titled “Intelligent Control in Energy Systems” have attempted to create a book containing original technical articles addressing various elements of intelligent control in energy systems. In response to our call for papers, we received 60 submissions. Of those submissions, 27 were published and 33 were rejected. In this book, we offer the 27 accepted technical articles as well as one editorial. Authors from 15 countries (China, Netherlands, Spain, Tunisia, United Sates of America, Korea, Brazil, Egypt, Denmark, Indonesia, Oman, Canada, Algeria, Mexico, and the Czech Republic) elaborate on several aspects of intelligent control in energy systems. The book covers a broad range of topics including fuzzy PID in automotive fuel cell and MPPT tracking, neural networks for fuel cell control and dynamic optimization of energy management, adaptive control on power systems, hierarchical Petri Nets in microgrid management, model predictive control for electric vehicle battery and frequency regulation in HVAC systems, deep learning for power consumption forecasting, decision trees for wind systems, risk analysis for demand side management, finite state automata for HVAC control, robust \(\mathcal{H}_\infty\) synthesis for microgrids, and neuro-fuzzy systems in energy storage.

**Special Issue: Smart Grid and Emerging Technology Integration**

Two large international conferences on Advances in Engineering Sciences were held in London, UK, 29 June - 1 July, 2016, under the World Congress on Engineering (WCE 2016), and San Francisco, USA, 19-21 October, 2016, under the World Congress on Engineering and Computer Science (WCECS 2016) respectively. This volume contains 42 revised and extended research articles written by prominent researchers participating in the conferences. Topics covered include electrical engineering, manufacturing engineering, industrial engineering, computer science, engineering mathematics and industrial applications. The book offers state-of-the-art advances in engineering sciences and also serves as an excellent reference work for researchers and graduate students working with/on engineering sciences.

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