

Ac Coupling Grid Tie Inverters With Outback Battery Based

This book constitutes the refereed post-conference proceedings of the 5th EA1 International Conference on Green Energy and Networking, GreeNets 2018, held in Guimarães, Portugal, in November 2018. The 15 full papers were selected from 26 submissions and cover a wide spectrum of ideas to reduce the impact of the climate change, while maintaining social prosperity. In this context, growing global concern leads to the adoption of the new technological paradigms, especially for the operation of future smart cities.

The book covers energy storage systems, bioenergy and hydrogen economy, grid integration of renewable energy systems, distributed generation, economic analysis, and environmental impacts of renewable energy systems. The overall approaches are interdisciplinary and comprehensive, covering economic, environmental, and grid integration issues as well as the physical and engineering aspects. Core issues discussed include mechanical, electrical, and thermal energy storage systems, batteries, fuel cells, biomass and biofuels, hydrogen economy, distributed generation, a brief presentation of microgrids, and in-depth discussions of economic analysis and methods of renewable energy systems, environmental impacts, life-cycle analysis, and energy conservation issues. With several solved examples, holistic material presentation, in-depth subject matter discussions and self-content material presentation, this textbook will appeal strongly to students and professional and nonprofessional readers who wish to understand this fascinating subject. Readers are encouraged to solve the problems and questions, which are useful ways to understand and apply the concepts and the topics included.

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

Hybrid Renewable Energy Systems and Microgrids covers the modeling and analysis for each type of integrated and operational hybrid energy system. Looking at the fundamentals for conventional energy systems, decentralized generation systems, RES technologies and hybrid integration of RES power plants, the most important contribution this book makes is combining emerging energy systems that improve micro and smart grid systems and their components. Sections cover traditional system characteristics, features, challenges and benefits of hybrid energy systems over the conventional power grid, the deployment of emerging power electronic technologies, and up-to-date electronic devices and systems, including AC and DC waveforms. Conventional, emerging and hierarchical control methods and technologies applied in microgrid operations are covered to give researchers and practitioners the information needed to ensure reliability, resilience and flexibility of implemented hybrid energy systems. Presents detailed contents on emerging power networks provided by decentralized and distributed generation approaches Covers driving factors, photovoltaic based power plant modeling and planning studies Introduces hierarchical control methods and technologies applied in microgrid operations to ensure reliability, resilience and flexibility of hybrid energy systems

Multilevel Converters: Control Techniques for Renewable Energy Resources

5th EA1 International Conference, GreeNets 2018, Guimarães, Portugal, November 21–23, 2018, Proceedings

Handbook of Research on Solar Energy Systems and Technologies

Modern Maximum Power Point Tracking Techniques for Photovoltaic Energy Systems

Proceedings of ICAIECES 2015

Modeling and Control of Power Electronic Converters for Microgrid Applications

This book is a technical publication for students, scholars and engineers in electrical engineering, focusing on the pulse-width-modulation (PWM) technologies in power electronics area. Based on an introduction of basic PWM principles this book analyzes three major challenges for PWM on system performance: power losses, voltage/current ripple and electromagnetic interference (EMI) noise, and the lack of utilization of control freedoms in conventional PWM technologies. Then, the model of PWM's impact on system performance is introduced, with the current ripple prediction method for voltage source converter as example. With the prediction model, two major advanced PWM methods are introduced: variable switching frequency PWM and phase-shift PWM, which can reduce the power losses and EMI for the system based on the prediction model. Furthermore, the advanced PWM can be applied in advanced topologies including multilevel converters and parallelled converters. With more control variables in the advanced topologies, performance of PWM can be further improved. Also, for the special problem for common-mode noise, this book introduces modified PWM method for reduction. Especially, the parallelled inverters with advanced PWM can achieve good performance for the common-mode noise reduction. Finally, the implementation of PWM technologies in hardware is introduced in the last part.

This two-volume set constitutes the post-conference proceedings of the 5th EA1 International Conference on Advanced Hybrid Information Processing, ADHIP 2021, held in October 2021. Due to COVID-19 the conference was held virtually. The 94 papers presented were selected from 254 submissions and focus on theory and application of hybrid information processing technology for smarter and more effective research and application. The theme of ADHIP 2020 was "Social hybrid data processing". The papers are named in topical sections as follows: Intelligent algorithms in complex environment; AI system research and model design; Method research on Internet of Things technology; Research and analysis with intelligent education.

Renewable energy is the answer for future energy demand. Renewable energy is the energy that occurs in a natural manner and utilizes unlimited resources. It is the solution for reducing the dependence on fossil fuels and diminishing greenhouse gas emission. It is the key for cleaner, greener, and sustainable energy. In today's world, increased energy needs and environmental and health concerns associated with traditional energy systems have made way for rapid progress in producing energy from renewable resources. However, large-scale integration of current technologies and newer approaches are still required for more efficient and cost-effective systems. This small book is a collection of single research chapters dealing with biofuel generation and some recent methods for grid integration and storage problems. The editors would like to record their sincere thank to the authors of energy storage systems, batteries, fuel cells, biomass and biofuels, hydrogen economy, distributed generation, a brief presentation of microgrids, and in-depth discussions of economic analysis and methods of renewable energy systems, environmental impacts, life-cycle analysis, and energy conservation issues.

Smart grid and microgrid technology are growing exponentially as they are adopted throughout the world. These new technologies have revolutionized the way electricity is produced, delivered, and consumed, and offer a plethora of benefits as well as the potential for further growth. It is critical to examine the current state of smart grid and microgrid development as well as the direction they are headed as they continue to expand in order to ensure that cost-effective, reliable, and efficient systems are put in place. The Research Anthology on Smart Grid and Microgrid Development is an all-encompassing reference source of the latest innovations and trends within smart grid and microgrid development. Detailing benefits, challenges, and opportunities, it is a crucial resource to fully understand the current opportunities that smart grids and microgrids present around the world. Covering a wide range of topics such as traditional grids, future smart grids, electrical distribution systems, and microgrid integration, it is ideal for engineers, policymakers, systems developers, technologists, researchers, government officials, academicians, environmental groups, regulators, utilities specialists, industry professionals, and students.

Smart Solar PV Inverters with Advanced Grid Support Functionalities

Research Anthology on Smart Grid and Microgrid Development

Control Contributions to AC Microgrid Inverters

Smart Metering Technology and Services

Power Electronics in Renewable Energy Systems

Advanced Hybrid Information Processing

This book addresses the emerging trend of smart grids in power systems. It discusses the advent of smart grids and selected technical implications; further, by combining the perspectives of researchers from Europe and South America, the book captures the status quo of and approaches to smart grids in a wide range of countries. It describes the basic concepts, enabling readers to understand the theoretical aspects behind smart grid formation, while also examining current challenges and philosophical discussions. Like the industrial revolution and the birth of the Internet, smart grids are certain to change the way people use electricity. In this regard, a new term – the “prosumer” – is used to describe consumers who may sometimes also be energy producers. This is particularly appealing if we bear in mind that most of the distributed power generation in smart grids does not involve carbon emissions. At first glance, the option of generating their own power could move consumers to leave their current energy provider. Yet the authors argue that doing so is not a wise choice: utilities will play a central role in this new scenario and should not be ignored.

This volume comprises select proceedings of ETAEERE-2016. The volume offers state-of-the-art chapters on energy management systems (EMS), renewable energy resources, micro-generation, green communications architectures and frameworks, green computing and education as well as energy-aware process optimization. The contents covers a wide variety of topics and aspects including management of renewable energy systems and environmental challenges. The contents of this volume will be useful to researchers and practicing engineers working in the areas of smart grids and renewable energy generation, distribution, and management.

Most renewable energy systems aren't new, but their use is. This handbook shows how each of the main renewable energy technologies works, along with step-by-step details of how it's installed, as well as the pros and – at least as importantly – the cons of each type of installation.

This book addresses the design and 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 advanced technologies and governing standards used in developing communication networks for realizing various smart services and applications in microgrid. 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.

Handbook of Research on Smart Power System Operation and Control

Lithium-Ion Batteries and Applications: A Practical and Comprehensive Guide to Lithium-Ion Batteries and Arrays, from Toys to Towns, Volume 2, Applications

Design, Challenges, and Prospects

Reduced DC-link Capacitance AC Motor Drives

PV and the NEC

Advanced Pulse-Width-Modulation: With Freedom to Optimize Power Electronics Converters

THE ELECTRICIAN'S GREEN HANDBOOK is written for students with an interest in the inner workings of alternative energy systems. This book is written by an electrician about electrical systems for electricians, maintenance personnel and students who are looking to expand their knowledge in alterative energy systems. Real world state of the art components are used in this book, complete with details and product specifications. Alternative energy systems discussed include Solar, Wind, Hydrogen and Battery Backup Systems. Unlike most other books written on the subject, THE ELECTRICIAN'S GREEN HANDBOOK, will provide your students with an understanding of these systems from an installation and maintenance point of view. Discussed in detail are the circuit configurations of stand-alone inverters, string inverters, central inverters, micro-inverters and rectifiers, the key components of any alternative energy installation used today. The National Electrical Code (NEC) 2011 is used throughout the text and systems are taken apart and the NEC 2011 is examined for each part of the systems. Monitoring the output of alternative energy systems is not only required for maximum efficiency, it is essential. This book covers the components, systems and topologies for monitoring the system functions and performance and is a must for the journeyman electrician and electrical students of all levels. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version.

Used throughout the United States and many other countries, the National Electrical Code (NEC) is the world's most detailed set of electrical codes pertaining to photovoltaic (PV) systems. PV and the NEC presents a straightforward explanation of the NEC in everyday language. This new edition is based on the 2020 NEC, which will be used widely until 2026, with most of the interpretations and material staying true long after. This book interprets the distinct differences between previous versions of the NEC and the 2020 NEC and clarifies how these code changes relate specifically to PV installations. Written by two of the leading authorities and educators in the field, this book will be a vital resource for solar professionals, as well as anyone preparing for a solar certification exam.

Multilevel Inverters: Control Methods and Power Electronics Applications provides a suite of powerful control methods for conventional and emerging inverter topologies instrumentalized in power electronics applications. It introduces readers to the conventional pulse width modulation control of multilevel voltage source inverter topologies before moving through more advanced approaches including hysteresis control, proportional resonance control, and model predictive control. Later chapters survey the power electronics connection between device topologies and control methods, particularly focusing on conversion in renewable energy systems, electric vehicles, static VAR compensators and solid-state transformers. Examines modern design configurations for multilevel inverter controllers, emerging control methods, and their applications Presents detailed application examples of multilevel inverters deployed in modern and recent power electronic areas including renewable energy sources, electric vehicles, and grid management Discusses deployment and development of future power converter implementation

Across a variety of disciplines, data and statistics form the backbone of knowledge. To ensure the reliability and validity of data, appropriate measures must be taken in conducting studies and reporting findings. Research Methods: Concepts, Methodologies, Tools, and Applications compiles chapters on key considerations in the management, development, and distribution of data. With its focus on both fundamental concepts and advanced topics, this multi-volume reference work will be a valuable addition to researchers, scholars, and students of science, mathematics, and engineering.

Microgrids Design and Implementation

Innovations in Electrical and Electronic Engineering

Artificial Intelligence and Evolutionary Computations in Engineering Systems

5th EA1 International Conference, ADHIP 2021, Virtual Event, October 22-24, 2021, Proceedings, Part II

ICPERES 2021

Generation, Storage, and Grids

This book gathers selected research papers presented at the International Conference on Power, Control and Communication Infrastructure 2019 (ICPCCI 2019), organized by the Institute of Infrastructure, Technology, Research and Management (IITRAM), Ahmedabad, Gujarat, India, on July 4-5, 2019. It presents the latest advances, trends and challenges in control system technologies and infrastructures. The book addresses a range of solutions to the problems faced by engineers and researchers to design and develop controllers for emerging areas like smart grid, integration of renewable energy, automated highway systems, haptics, unmanned aerial vehicles, sensor networks, robotics, formation control and many more. The solutions discussed in this book encourage and inspire researchers, industry professionals and policymakers to put these methods into practice.

This book covers the fundamentals of power electronic converter modeling and control, digital simulation, and experimental studies in the area of renewable energy systems and AC/DC microgrid. Recent advanced control methods for voltage source inverters (VSI) and the hierarchical controlled islanded microgrid are discussed, including the mathematical modeling, controller synthesis, parameter selection and multi-scale stability analysis, and consensus-based control strategies for the microgrid and microgrid clusters. The book will be an invaluable technical reference for practicing engineers and researchers working in the areas of renewable energy, power electronics, energy internet, and smart grid. It can also be utilized as reference book for undergraduate and postgraduate students in electrical engineering.

Power Electronic Converters for Solar Photovoltaic Systems provides design and implementation procedures for power electronic converters and advanced controllers to improve standalone and grid environment solar photovoltaics performance. Sections cover performance and improvement of solar photovoltaics under various conditions with the aid of intelligent controllers, allowing readers to better understand the nuances of power electronic converters for renewable energy systems. With algorithm development and real-time implementation procedures, this reference is useful for those interested in power electronics for performance improvement in distributed energy resources, design of advanced controllers, and measurement of critical parameters surrounding renewable energy systems. By providing a complete solution for performance improvement in solar PV with novel control techniques, this book will appeal to researchers and engineers working in power electronic converters, renewable energy, and power quality. Includes simulation studies and photovoltaic performance analysis Uses case studies as a reference for design and research Covers different varieties of power converters, from fundamentals to implementation

Continuous cost reduction of photovoltaic (PV) systems and the rise of power auctions resulted in the establishment of PV power not only as a green energy source but also as a cost-effective solution to the electricity generation market. Various commercial solutions for grid-connected PV systems are available at any power level, ranging from multi-megawatt utility-scale solar farms to sub-kilowatt residential PV installations. Compared to utility-scale systems, the feasibility of small-scale residential PV installations is still limited by existing technologies that have not yet properly address issues like operation in weak grids, opaque and partial shading, etc. New market drivers such as warranty improvement to match the PV module lifespan, operation voltage range extension for application flexibility, and embedded energy storage for load shifting have again put small-scale PV systems in the spotlight. This Special Issue collects the latest developments in the field of power electronic converter topologies, control, design, and optimization for better energy yield, power conversion efficiency, reliability, and longer lifetime of the small-scale PV systems. This Special Issue will serve as a reference and update for academics, researchers, and practicing engineers to inspire new research and developments that pave the way for next-generation PV systems for residential and small commercial applications.

Smart Microgrids

The Renewable Energy Home Handbook

Microgrids

Control Methods and Advanced Power Electronic Applications

The Electricians Green Handbook

Energy Storage, Grid Integration, Energy Economics, and the Environment

This comprehensive, two-volume resource provides a thorough introduction to lithium ion (Li-ion) technology. Readers get a hands-on understanding of Li-ion technology, are guided through the design and assembly of a battery, through deployment, configuration and testing. The book covers dozens of applications, with solutions for each application provided. Volume Two focuses on small batteries in consumer products and power banks, as well as large low voltage batteries in stationary or mobile house power, telecom, residential, marine and microgrid. Traction batteries, including passenger, industrial, race vehicles, public transit, marine, submarine and aircraft are also discussed. High voltage stationary batteries grid-tied and off-grid are presented, exploring their use in grid quality, arbitrage and back-up, residential, microgrid, industrial, office buildings. Finally, the book explores what happens when accidents occur, so readers may avoid these mistakes. Written by a prominent expert in the field and packed with over 500 illustrations, these volumes contain solutions to practical problems, making it useful for both the novice and experienced practitioners.

Hybrid energy systems integrate multiple sources of power generation, storage, and transport mechanisms and can facilitate increased usage of cleaner, renewable, and more efficient energy sources. Hybrid Power: Generation, Storage, and Grids discusses hybrid energy systems from fundamentals through applications and discusses generation, storage, and grids. Highlights fundamentals and applications of hybrid energy storage Discusses use in hybrid and electric vehicles and home energy needs Discusses issues related to hybrid renewable energy systems connected to the utility grid Describes the usefulness of hybrid microgrids and various forms of off-grid energy such as mini-grids, nanogrids, and stand-alone systems Covers the use of hybrid renewable energy systems for rural electrification around the world Discusses various forms and applications of hybrid energy systems, hybrid energy storage, hybrid microgrids, and hybrid off-grid energy systems Details simulation and optimization of hybrid renewable energy systems This book is aimed at advanced students and researchers in academia, government, and industry, seeking a comprehensive overview of the basics, technologies, and applications of hybrid energy systems.

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 policies. The book looks for 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.

The last ten years have seen rapid advances in nanoscience and nanotechnology, allowing unprecedented manipulation of the nanoscale structures controlling solar capture, conversion, and storage. Filled with cutting-edge solar energy research and reference materials, the Handbook of Research on Solar Energy Systems and Technologies serves as a one-stop resource for the latest information regarding different topical areas within solar energy. This handbook will emphasize the application of nanotechnology innovations to solar energy technologies, explore current and future developments in third generation solar cells, and provide a detailed economic analysis of solar energy applications.

Inspirations for Energy Utilities

Operation and Control

Concepts, Methodologies, Tools, and Applications

PV Technical Sales

Emerging Converter Topologies and Control for Grid Connected Photovoltaic Systems

Proceedings of International Conference on Power Electronics and Renewable Energy Systems

This book is a collection of high-quality peer-reviewed research papers presented in the first International Conference on International Conference on Artificial Intelligence and Evolutionary Computations in Engineering Systems (ICAIECES -2015) held at Velammal Engineering College (VEC), Chennai, India during 22 – 23 April 2015. The book discusses wide variety of industrial, engineering and scientific applications of the emerging techniques. Researchers from academic and industry present their original work and exchange ideas, information, techniques and applications in the field of Communication, Computing and Power Technologies.

This book features selected papers from the International Conference on Power Electronics and Renewable Energy Systems (ICPERES 2021), organized by SRM Institute of Science and Technology, Chennai, India, during April 2021. It covers recent advances in the field of soft computing applications in power systems, power system modeling and control, power system stability, power quality issues and solutions, smart grid, green and renewable energy technology optimization techniques in electrical systems, power electronics controllers for power systems, power converters and modeling, high voltage engineering, networking grid and cloud computing, computer architecture and embedded systems, fuzzy logic control, fuzzy decision support systems, and control systems. The book presents innovative work by leading academics, researchers, and experts from industry.

This thesis is focused on the microgrid control framework. Specifically, it is concentrated on alternative current microgrids. As a result of the author involvement in different industrial projects concerning microgrids during the last years, the goal of the thesis is to apply and expose the acquired experiences for exploring new control possibilities. The followed methodology is detailed in the next lines. Primarily, the thesis presents two chapters whose purpose is to introduce the concept of operation and to analyse the context and challenges posed by microgrids from a top to bottom approach. The first chapter is oriented in general terms while the second one devotes more efforts in the alternative current microgrids particular case. After identifying the different actors that play an key role in the alternative current microgrids it is disclosed that the inverter becomes a key element. In this sense, the first two chapters allows to pave the way addressing how an inverter installed in an alternative current microgrid can be operated. In this direction, the named grid-tied operation mode reflects the most complex configuration. Considering that the scope of the thesis is focused on voltage source inverters, the grid-tied configuration may not only consider the grid-connected or grid-disconnected operation mode but also the transients between them. Thus, important challenges such as the inverter operation itself, the anti-islanding detection capability according to the behaviour of the inverter and the galvanic isolation restriction in a microgrid framework are dealt. The control of the voltage source inverters operated in an alternative microgrid results crucial. For this reason, a full chapter carries out a study proposing and deriving into various type of controllers according to different possibilities exposed in the literature. It is conducted a stability analysis for stationary reference frame resonant current and voltage controllers. The chapter concludes with a new hybrid formulation based on fractional calculus and conventional resonant control. This novel formulation allows to enhance the controllable frequency bandwidth range decreasing inter-harmonic excitations and reducing the controller order in respect with other classical formulations. The fourth and fifth chapters are involved into discussing and presenting different operation options when the inverter is considered as a current or as a voltage source. The fourth chapter poses over how to tackle the problem of transients when a current source grid-tied inverter is assumed while grid-connected operated. Two situations are studied: the flying transference from current to voltage source and how to extend the maximum power point extraction when a back-up system supports the inverter operation. A set of different scenarios conducted in simulation and in a real experimental platform complements the two considered situations. The fifth chapter analyses the operation of the inverter from an opposite perspective. The considered inverter is operated by using a hybrid combination between alternative current droop control strategy when grid-connected and voltage-frequency control when grid-disconnected. In this way it is possible to preserve dynamics capabilities in both operation modes meanwhile the inverter is treated as a voltage source in any case. A predominant resistive model applying virtual resistance is considered for the case of alternative current droop control. For both operation modes an LCL-type coupling filter is assumed, complementing the control strategy with an active damping mechanism to mitigate possible resonances. Then, a three-phase four-wire four-leg inverter is proposed to match better with a proper approximation to the AC microgrid with over-load supervisor when grid-connected and sinusoidal short-circuit proof when grid-disconnected operated.

The book addresses the needs of researchers on the fundamentals as well as more advanced knowledge on microgrids and their evolution. This book covers newly emerging trends in fields such as Computer Science, Energy, Electrical Engineering, and Electronics and brings the reader up-to-date on the new emerging fields that play an important role in the power infrastructure. This book provides knowledge on decision making for newly evolving trends in microgrid design. It discusses techniques on how to improve the existing power quality and reduce load shedding and power imbalances. The book presents the emerging fields that now play an important role in microgrid design such as Data Science, Machine Learning, AI, and IT. The readership includes researchers, academia, practicing engineers, consumers, power companies and policy makers located across the globe.

Green Energy and Networking

Proceedings of ICEEE 2022, Volume 2

Hybrid Power

Network, Control and Security

Power Electronics in Smart Electrical Energy Networks

Power Electronic Converters for Solar Photovoltaic Systems

This book offers a collection of 38 scientific papers which address the problems associated with the use of power electronic converters in renewable energy source-based systems. Relevant problems associated with the use of power electronic converters to integrate renewable energy systems to the power grid are presented. Some of the covered topics relate to the integration of photovoltaic and wind energy generators into the rest of the system, and to the use of energy storage to mitigate power fluctuations, which are a characteristic of renewable energy systems. The book provides a good overview of the abovementioned topics.

“Power Electronics in Smart Electrical Energy Networks” introduces a new viewpoint on power electronics, re-thinking the basic philosophy governing electricity distribution systems. The proposed concept fully exploits the potential advantages of renewable energy sources and distributed generation (DG) which should not only be connected but also fully integrated into the distribution system in order to increase the efficiency, flexibility, safety, reliability and quality of the electricity and the networks. The transformation of current electricity grids into smart (resilient and interactive) networks necessitates the development, propagation and demonstration of key enabling cost-competitive technologies. A must-read for professionals in power engineering and utility industries, and researchers and postgraduates in distributed electrical power systems, the book presents the features, solutions and applications of the power electronics arrangements useful for future smart electrical energy networks.

This book introduces and analyses the latest maximum power point tracking (MPPT) techniques, which can effectively reduce the cost of power generated from photovoltaic energy systems. It also presents a detailed description, analysis, and comparison of various MPPT techniques applied to stand-alone systems and those interfaced with electric utilities, examining their performance under normal and abnormal operating conditions. These techniques, which can be conventional or smart, are a current hot topic, and this book is a valuable reference resource for academic researchers and industry professionals who are interested in exploring and implementing advanced MPPT for photovoltaic systems. It is also useful for graduate students who are looking to expand their knowledge of MPPT techniques.

This book focuses on the advanced control of reduced dc-link capacitance AC motor drives. Compared with the conventional AC motor drives, the reduced DC-link capacitance motor drives could reduce the cost, enhance the reliability and improve the power density. The control strategies proposed in this book are verified by experimental results, which include high power factor control, drive system stability control, beat phenomenon suppression, enhanced flux-weakening control, anti-oversvoltage control, etc. The major features of this book are the systematic analysis, effective and optimized control of the practical issues in industry application, which could help readers to learn the reduced dc-link capacitance PMSM drives and promote the drive system application. This book could benefit researchers, engineers, and students in the field of AC motor drives.

Advances in Smart Grid Power System

Home Power

Advances in Smart Grid and Renewable Energy

Research Methods: Concepts, Methodologies, Tools, and Applications

Preparation for the NABCEP Technical Sales Certification

Solar Today

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.

Learn the fundamentals of smart photovoltaic (PV) inverter technology with this insightful one-stop resource Smart Solar PV Inverters with Advanced Grid Support Functionalities presents a comprehensive coverage of smart PV inverter technologies in alleviating grid integration challenges of solar PV systems and for additionally enhancing grid reliability. Accomplished author Rajiv Varma systematically integrates information from the wealth of knowledge on smart inverters available from EPRI, NREL, NERC, SHWG, EU-PVSEC, CIGRE, IEEE publications, and utility experiences worldwide. The book further presents a novel, author-developed and patented smart inverter technology for utilizing solar PV plants both in the night and day as a Flexible AC Transmission System (FACTS) Controller STATCOM, named PV-STATCOM. Replete with case studies, this book includes over 600 references and 280 illustrations. Smart Solar PV Inverters with Advanced Grid Support Functionalities’ features include: Concepts of active and reactive power control; description of different smart inverter functions, and modeling of smart PV inverter systems Distribution system applications of PV-STATCOM for dynamic voltage control, enhancing connectivity of solar PV and wind farms, and stabilization of critical motors Transmission system applications of PV-STATCOM for improving power transfer capacity, power oscillation damping (POD), suppression of subsynchronous oscillations, mitigation of fault induced delayed voltage recovery (FIDVR), and fast frequency response (FFR) with POD Hosting capacity for solar PV systems, its enhancement through effective settings of different smart inverter functions; and control coordination of smart PV inverters Emerging smart inverter grid support functions and their pioneering field demonstrations worldwide, including Canada, USA, UK, Chile, and India. Perfect for system planners and system operators, utility engineers, inverter manufacturers and solar farm developers, this book will prove to be an important resource for academics and graduate students involved in electrical power and renewable energy systems.

NABCEP sets the standard for solar certifications in the United States and Canada. The NABCEP PV Technical Sales Certification shows customers, friends and employers that you are knowledgeable and qualified to sell solar systems. If someone is selling solar, they need to know what they are selling and how it is configured. Where will they connect the circuit breaker? Will the house need expensive modifications in order for a PV system to be installed? These are the questions that you as a NABCEP Technical Sales Certified solar salesperson will confidently answer. This book is full of practical information that anyone selling solar should know in order to properly serve their customers and to ethically represent the industry that is solving the world’s problems on the ground and rooftop level. This book will be of use to those taking the NABCEP PV Technical Sales Exam, as well as anyone selling or planning to sell solar.

Proceedings of ICPCCI 2019

Advances in Control Systems and its Infrastructure

Hybrid Renewable Energy Systems and Microgrids

Special Topics in Renewable Energy Systems

Multilevel Inverters

Active Building Energy Systems