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Power Quality Enhancement Using Custom Power Devices
Facts Controllers in Power Transmission and Distribution
Static Compensators (STATCOMs) in Power Systems
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2020 IEEE PES IAS PowerAfrica
Electrical Pw Dist Sys
Transmission And Distribution
Handbook of Power Quality
Power Quality
Power Quality
Practical Power Distribution for Industry
Reactive Power Compensation
Reactive Power Compensation
Transmission & Distribution
POWER SYSTEM OPTIMIZATION
Power Quality in Power Systems and Electrical Machines
Transmission And Distribution Of Electrical Power
Elements of Power System Analysis

Reactive Power Control in AC Power Systems

The second edition of this must-have reference covers power quality issues in four parts, including new discussions related to renewable energy systems. The first part of the book provides background on causes, effects, standards, and measurements of power quality and harmonics. Once the basics are established the authors move on to harmonic modeling of power systems, including components and apparatus (electric machines). The final part of the book is devoted to power quality mitigation approaches and devices, and the fourth part extends the analysis to power quality solutions for renewable energy systems. Throughout the book worked examples and exercises provide practical applications, and tables, charts, and graphs offer useful data for the modeling and analysis of power quality issues. Provides theoretical and practical insight into power quality problems of electric machines and systems 134 practical application (example) problems with solutions 125 problems at the end of chapters dealing with practical applications 924 references, mostly journal articles and conference papers, as well as national and international standards and guidelines

America's Energy Future

Maintaining a stable level of power quality in the distribution network is a growing challenge due to increased use of power electronics converters in domestic, commercial and industrial sectors. Power quality deterioration is manifested in increased losses; poor utilization of distribution systems; mal-operation of sensitive equipment and disturbances to nearby consumers, protective devices, and communication systems. However, as the energy-saving benefits will result in increased AC power processed through power electronics converters, there is a compelling need for improved understanding of mitigation techniques for power quality problems. This timely book comprehensively identifies, classifies, analyses and quantifies all associated power quality problems, including the direct integration of renewable energy sources in the distribution system, and systematically delivers mitigation techniques to overcome these problems. Key features: Emphasis on in-depth learning of the latest topics in power quality extensively illustrated with waveforms and phasor diagrams. Essential theory supported by solved numerical examples, review questions, and unsolved numerical problems to reinforce understanding. Companion website contains solutions to unsolved numerical problems, providing hands-on experience. Senior undergraduate and graduate electrical engineering students and instructors will find this an invaluable resource for education in the field of power quality. It will also support continuing professional development for practicing engineers in distribution and transmission system operators.

Reactive Power Compensation

Design and Control of Hybrid Active Power Filters presents an overview of the current quality problems and their compensators. To get a balance between the system cost and performance, hybrid active power filters (HAPFs) are valuable. The book presents the coverage of resonance phenomena prevention capability, filtering performance and system robustness analysis of HAPF; nonlinear inverter current slope characteristics and their linear operation region requirement analysis of the hysteresis PWM for the HAPF; minimum inverter capacity design procedure of HAPF, adaptive dc-link voltage controller for the HAPF and the real design example of a 220V 10kVA HAPF, in which the system performance analysis method, minimum dc voltage deduction concept and adaptive dc voltage idea can be further extended into the other active compensators, such as APF, static synchronous compensator STATCOM, etc. This book will benefit researchers, graduate students, and electrical power engineers in the field of power-quality compensation. Dr. Chi-Seng Lam and Dr. Man-Chung Wong are both from the University of Macau, Macao, China.

Electric Power Generation, Transmission, and Distribution

Both deregulation in the electrical supply industry and the creation of new electricity markets present electric utility companies with the challenge of becoming more efficient without compromising quality of service. Providing new solutions for this newly deregulated paradigm, Power Quality: VAR Compensation in Power Systems presents comprehensive

coverage of power quality, harmonics, and static var compensators in one single volume. The book explains how to ensure that power quality is not affected by the harmonics generated by power electronic equipment and explains how to reduce labor costs and increase reliability of supply by employing a single pole autoreclosing scheme. It also addresses how to analyze frequency response of current transformers and voltage transformers while measuring harmonics. Based on the authors' extensive experience in the electric supply industry, Power Quality enables engineers to meet the demands of increased loads, strengthen their transmission systems, and ensure reliable electric supply.

Reactive Power Management

The emerging technology of Flexible AC Transmission System (FACTS) enables planning and operation of power systems at minimum costs, without compromising security. This is based on modern high power electronic systems that provide fast controllability to ensure 'flexible' operation under changing system conditions. This book presents a comprehensive treatment of the subject by discussing the operating principles, mathematical models, control design and issues that affect the applications. The concepts are explained often with illustrative examples and case studies. In particular, the book presents an in-depth coverage of: Applications of SVC, TCSC, GCSC, SPST, STATCOM, SSSC, UPFC, IPFC and IPC for voltage/power control in transmission systems; Application of DSTATCOM, DVR and UPQC for improving power quality in distribution systems; Design of Power Oscillation Damping (POD) controllers; Discrete control of FACTS for improving transient stability; Mitigation of SSR using series FACTS Controllers; Issues affecting control design such as electromagnetic and harmonic interactions. The book can serve as a text or reference for a course on FACTS Controllers. It will also benefit researchers and practicing engineers who wish to understand and apply FACTS technology.

Active Power Line Conditioners

Shunt Active Power Filter

Part of the second edition of The Electric Power Engineering Handbook, Electric Power Generation, Transmission, and Distribution offers focused and detailed coverage of all aspects concerning the conventional and nonconventional methods of power generation, transmission and distribution systems, electric power utilization, and power quality. Contri

Energy, Environmental & Sustainable Ecosystem Development

As the electrical industry continues to develop, one sector that still faces a range of concerns is the electrical distribution

system. Excessive industrialization and inadequate billing are just a few issues that have plagued this electrical sector as it advances into the smart grid environment. Research is necessary to explore the possible solutions in fixing these problems and developing the distribution sector into an active and smart system. The Handbook of Research on New Solutions and Technologies in Electrical Distribution Networks is a collection of innovative research on the methods and applications of solving major issues within the electrical distribution system. Some issues covered within the publication include distribution losses, improper monitoring of system, renewable energy integration with micro-grid and distributed energy sources, and smart home energy management system modelling. This book is ideally designed for power engineers, electrical engineers, energy professionals, developers, technologists, policymakers, researchers, academicians, industry professionals, and students seeking current research on improving this key sector of the electrical industry.

Handbook of Research on New Solutions and Technologies in Electrical Distribution Networks

' In the rapid development of global economics, energy, environmental & ecosystem are recognized as important factors for sustainable development in human society. The application of measurement and control technology also play a very important role in the utilization and protection of energy and the environment. 2015 International Conference on Energy, Environmental & Sustainable Ecosystem Development (EESD 2015) is a multidisciplinary international conference that provides a platform for scientists, engineers and researchers worldwide to share their ideas and present solutions to energy, environmental & sustainable ecosystem development issues. Contents:Energy Science and TechnologyEnvironmental Science and EngineeringRenewable Energy and Sustainable DevelopmentEnergy, Environmental & Sustainable Ecological DevelopmentInfrastructure, Management and Environment Readership: Researchers, academics, professionals and graduate students in environmental science. Keywords:Energy Science and Technology;Environmental Science and Engineering;Renewable Energy and Sustainable Development;Energy;Environmental " Sustainable Ecological Development'

Power Quality

A unified approach to the fundamental principles and practices of reactive power control in AC power systems. Emphasizes voltage control, variable loads, and transmission. Covers high voltage and distribution systems, plus compensation equipment. Includes many practical numerical examples and useful formulas. Deals with real-world problems and solutions.

Advanced Design and Manufacturing Technology III

The PowerAfrica Conference provides a forum for research scientists, engineers, and practitioners to present and discuss

latest research findings, ideas, and emerging technologies and applications in the area of power systems integrations, business models, technological advances, policies and regulatory frameworks for the African continent

Generation, Transmission And Distribution

Power systems have two components of apparent power: active and reactive power. Both components are necessary for functioning of electrical systems. The active power is the average power absorbed by the resistive load. The reactive power is the measure of energy exchange between the source and reactive power of load. Energy storage devices do not dissipate or supply power, but exchange power with the rest of system. Active power is the one that is converted to other forms of energy in the load yet reactive power is only responsible for magnetizing purposes. Power factor is a ratio depicting how much of the power supplied is real. The reactive current contribute in the value of the overall magnitude of current in transmission lines causing unnecessarily high line currents and low power factor. Since a low power factor means higher amount of apparent power need to be supplied by the utility company, thus the company must also use bigger generators, large transformers and thicker transmission/distribution lines. This requires a higher capital expenditure and operational cost which usually result in the cost being passed to the consumer. In this research, we seek to identify the effects of a low power factor on Swaziland Electricity Company's power supply system and recommend possible solutions to the problem. The results are useful in determining how to optimally deliver power to a load at a power factor that is reasonably close to unity, thus reducing the utility's operational costs while increasing the quality of the service being supplied.

Power Quality in Power Systems and Electrical Machines

Collection of selected, peer reviewed papers from the 3rd International Conference on Advanced Design and Manufacturing Engineering (ADME 2013), 13-14 July, 2013, Anshan, China. The 547 papers are grouped as follows: Chapter 1: Advanced Manufacturing Technology; Chapter 2: Advanced Equipment Manufacture; Chapter 3: Fluid and Flow Engineering; Chapter 4: Dynamic Systems and Analysis, Machinery Dynamics and Dynamic Modelling; Chapter 5: Advanced Computer-Aided Design and Modelling Technologies in Mechanical Engineering and Mechanisms; Chapter 6: System Analysis and Industrial Engineering; Chapter 7: Innovative Design Methodology and Product Design; Chapter 8: Intelligent Optimization Design and Reverse Engineering; Chapter 9: Mechatronics, Automation and Control, Detection Technologies; Chapter 10: Industrial Robotics and Machine Vision, Navigation and GPS Technology; Chapter 11: Sensor Technologies; Chapter 12: Measurement and Monitoring Technologies; Chapter 13: Power, Energy, Microelectronic Technology and Embedded System; Chapter 14: Communication Technology, WEB and Network Engineering; Chapter 15: Signal and Intelligent Image, Video Information Processing, Data Mining; Chapter 16: Software Development and Application; Chapter 17: Computer Applications and Information Technologies in Industry and Engineering; Chapter 18: Production and Operation Management, Supply Chain,

Electronic E-Commerce and Internet of Things Application; Chapter 19: Management and Education Engineering.

Design and Control of Hybrid Active Power Filters

Power systems have two components of apparent power: active and reactive power. Both components are necessary for functioning of electrical systems. The active power is the average power absorbed by the resistive load. The reactive power is the measure of energy exchange between the source and reactive power of load. Energy storage devices do not dissipate or supply power, but exchange power with the rest of system. Active power is the one that is converted to other forms of energy in the load yet reactive power is only responsible for magnetizing purposes. Power factor is a ratio depicting how much of the power supplied is real. The reactive current contribute in the value of the overall magnitude of current in transmission lines causing unnecessarily high line currents and low power factor. Since a low power factor means higher amount of apparent power need to be supplied by the utility company, thus the company must also use bigger generators, large transformers and thicker transmission/distribution lines. This requires a higher capital expenditure and operational cost which usually result in the cost being passed to the consumer. In this research, we seek to identify the effects of a low power factor on Swaziland Electricity Company's power supply system and recommend possible solutions to the problem. The results are useful in determining how to optimally deliver power to a load at a power factor that is reasonably close to unity, thus reducing the utility's operational costs while increasing the quality of the service being supplied.

Advances in Swarm Intelligence, Part I

When planning an industrial power supply plant, the specific requirements of the individual production process are decisive for the design and mode of operation of the network and for the selection and design and ratings of the operational equipment. Since the actual technical risks are often hidden in the profound and complex planning task, planning decisions should be taken after responsible and careful consideration because of their deep effects on supply quality and energy efficiency. This book is intended for engineers and technicians of the energy industry, industrial companies and planning departments. It provides basic technical network and plant knowledge on planning, installation and operation of reliable and economic industrial networks. In addition, it facilitates training for students and graduates in this field. In an easy and comprehensible way, this book informs about solution competency gained in many years of experience. Moreover, it also offers planning recommendations and knowledge on standards and specifications, the use of which ensures that technical risks are avoided and that production and industrial processes can be carried out efficiently, reliably and with the highest quality.

Reactive Power Compensation

This book presents a solid theoretical foundation of the modern mitigation technologies employed in the power quality arena, and provides an overview of the most recent challenges in this field. The book introduces the advanced concepts associated with power quality to engineers and students. It will make an excellent reference for facility electrical power engineers and maintenance technicians.

Transmission and Distribution Electrical Engineering

An important new resource for the international utility market Over the past two decades, static reactive power compensators have evolved into a mature technology and become an integral part of modern electrical power systems. They are one of the key devices in flexible AC transmission systems (FACTS). Coordination of static compensators with other controllable FACTS devices promises not only tremendously enhanced power system controllability, but also the extension of power transfer capability of existing transmission corridors to near their thermal capacities, thus delaying or even curtailing the need to invest in new transmission facilities. Offering both an in-depth presentation of theoretical concepts and practical applications pertaining to these power compensators, Thyristor-Based FACTS Controllers for Electrical Transmission Systems fills the need for an appropriate text on this emerging technology. Replete with examples and case studies on control design and performance, the book provides an important resource for both students and engineers working in the field.

Thyristor-Based FACTS Controllers for Electrical Transmission Systems

Featuring contributions from worldwide leaders in the field, the carefully crafted Electric Power Generation, Transmission, and Distribution, Third Edition (part of the five-volume set, The Electric Power Engineering Handbook) provides convenient access to detailed information on a diverse array of power engineering topics. Updates to nearly every chapter keep this book at the forefront of developments in modern power systems, reflecting international standards, practices, and technologies. Topics covered include: Electric power generation: nonconventional methods Electric power generation: conventional methods Transmission system Distribution systems Electric power utilization Power quality L.L. Grigsby, a respected and accomplished authority in power engineering, and section editors Saifur Rahman, Rama Ramakumar, George Karady, Bill Kersting, Andrew Hanson, and Mark Halpin present substantially new and revised material, giving readers up-to-date information on core areas. These include advanced energy technologies, distributed utilities, load characterization and modeling, and power quality issues such as power system harmonics, voltage sags, and power quality monitoring. With six new and 16 fully revised chapters, the book supplies a high level of detail and, more importantly, a tutorial style of writing and use of photographs and graphics to help the reader understand the material. New chapters cover: Water Transmission Line Reliability Methods High Voltage Direct Current Transmission System Advanced Technology High-Temperature

Conduction Distribution Short-Circuit Protection Linear Electric Motors A volume in the Electric Power Engineering Handbook, Third Edition. Other volumes in the set: K12648 Power Systems, Third Edition (ISBN: 9781439856338) K13917 Power System Stability and Control, Third Edition (ISBN: 9781439883204) K12650 Electric Power Substations Engineering, Third Edition (ISBN: 9781439856383) K12643 Electric Power Transformer Engineering, Third Edition (ISBN: 9781439856291)

Power Quality Enhancement Using Custom Power Devices

Reactive Power Management brings into focus this subject which has assumed importance due to high transmission and distribution losses. Divided into four parts, the book covers the subject in its entirety and enables engineers understand the why, how and what to expect of the problems associated with reactive power. Highlights: Part I: basic concepts and related topics like quality of supply, cost of reactive power, power tariffs and market forces are included. Part II: Sources which cause, and equipment and transmission lines which suppress, reactive are covered. Part III: Latest developments in the transmission networks, particularly FACTS are discussed. Part IV: Reactive and energy management of residential as well as large industrial consumers like steel, cement, petroleum, paper, mining, textiles, etc. are covered. Richly illustrated with examples, the book will be useful to power utilities, electricity boards and diverse industries, including power, petroleum, cement, glass, coal, etc.

Facts Controllers in Power Transmission and Distribution

The comprehensive resource on reactive power compensation, presenting the design, application and operation of reactive power equipment and installations The area of reactive power compensation is gaining increasing importance worldwide. If suitably designed, it is capable of improving voltage quality significantly, meaning that losses in equipment and power systems are reduced, the permissible loading of equipment can be increased, and the over-all stability of system operation improved. Ultimately, energy use and CO₂ emission are reduced. This unique guide discusses the effects of reactive power on generation, transmission and distribution, and looks at the compensation of existing installations in detail. It outlines methods for determination of reactive power and answers the questions that arise when controlling it, for example, at parallel operation with generators. There is also a chapter devoted to installation, maintenance and disturbances. Key features include: A concise overview as well as deep specific knowledge on the segment power factor regulation and network quality Theory of reactive power compensation coupled with typical application examples such as car manufacturing, metal rolling and chemical works Chapter summaries with charts explaining how to put the theory into practice Coverage on the cost-saving aspects of this technology, including the efficient use of energy and the reduction of CO₂ A practical guide for electrical engineers and technicians in utilities, this is also essential reading for maintenance engineers, designers, electrical contractors, manufacturing companies, and researchers, also those in industry and planning

agencies. Insightful and clear, the book will also appeal to senior undergraduate and graduate electrical engineering students and professors.

Static Compensators (STATCOMs) in Power Systems

Reactive Power Control in Electric Systems

Power Quality

Due to the complexity of power systems combined with other factors such as increasing susceptibility of equipment, power quality (PQ) is apt to waver. With electricity in growing demand, low PQ is on the rise and becoming notoriously difficult to remedy. It is an issue that confronts professionals on a daily basis, but few have the required knowledge to diagnose and solve these problems. Handbook of Power Quality examines of the full panorama of PQ disturbances, with background theory and guidelines on measurement procedures and problem solving. It uses the perspectives of both power suppliers and electricity users, with contributions from experts in all aspects of PQ supplying a vital balance of scientific and practical information on the following: frequency variations; the characteristics of voltage, including dips, fluctuations and flicker; the continuity and reliability of electricity supply, its structure, appliances and equipment; the relationship of PQ with power systems, distributed generation, and the electricity market; the monitoring and cost of poor PQ; rational use of energy. An accompanying website hosts case studies for each chapter, demonstrating PQ practice; how problems are identified, analysed and resolved. The website also includes extensive appendices listing the current standards, mathematical formulas, and principles of electrical circuits that are critical for the optimization of solutions. This comprehensive handbook explains PQ methodology with a hands-on approach that makes it essential for all practising power systems engineers and researchers. It simultaneously acts as a reference for electrical engineers and technical managers who meet with power quality issues and would like to further their knowledge in this area.

Planning Guide for Power Distribution Plants

Electric Power Generation, Transmission, and Distribution

Power Quality Enhancement Using Custom Power Devices considers the structure, control and performance of series

compensating DVR, the shunt DSTATCOM and the shunt with series UPQC for power quality improvement in electricity distribution. Also addressed are other power electronic devices for improving power quality in Solid State Transfer Switches and Fault Current Limiters. Applications for these technologies as they relate to compensating busses supplied by a weak line and for distributed generation connections in rural networks, are included. In depth treatment of inverters to achieve voltage support, voltage balancing, harmonic suppression and transient suppression in realistic network environments are also covered. New material on the potential for shunt and series compensation which emphasizes the importance of control design has been introduced.

Optimization of Power System Problems

This textbook explores reactive power control and voltage stability and explains how they relate to different forms of power generation and transmission. Bringing together international experts in this field, it includes chapters on electric power analysis, design and operational strategies. The book explains fundamental concepts before moving on to report on the latest theoretical findings in reactive power control, including case studies and advice on practical implementation students can use to design their own research projects. Featuring numerous worked-out examples, problems and solutions, as well as over 400 illustrations, Reactive Power Control in AC Power Systems offers an essential textbook for postgraduate students in electrical power engineering. It offers practical advice on implementing the methods discussed in the book using MATLAB and DlgSILENT, and the relevant program files are available at extras.springer.com.

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Electrical Pw Dist Sys

The book provides technical know-how not covered by most universities and colleges in a subject that is central to the roles of many electrical engineers in industry, focusing on switchgear, power cables, power factor correction, and network studies. * Learn how to install and maintain electrical power equipment in industrial settings * Select and specify the right power system at the right price * Provides the practical essentials for reliable operation of industrial electrical networks - covering switchgear, cabling and power correction factors

Transmission And Distribution

Maintaining a stable level of power quality in the distribution network is a growing challenge due to increased use of power

electronics converters in domestic, commercial and industrial sectors. Power quality deterioration is manifested in increased losses; poor utilization of distribution systems; mal-operation of sensitive equipment and disturbances to nearby consumers, protective devices, and communication systems. However, as the energy-saving benefits will result in increased AC power processed through power electronics converters, there is a compelling need for improved understanding of mitigation techniques for power quality problems. This timely book comprehensively identifies, classifies, analyses and quantifies all associated power quality problems, including the direct integration of renewable energy sources in the distribution system, and systematically delivers mitigation techniques to overcome these problems. Key features: Emphasis on in-depth learning of the latest topics in power quality extensively illustrated with waveforms and phasor diagrams. Essential theory supported by solved numerical examples, review questions, and unsolved numerical problems to reinforce understanding. Companion website contains solutions to unsolved numerical problems, providing hands-on experience. Senior undergraduate and graduate electrical engineering students and instructors will find this an invaluable resource for education in the field of power quality. It will also support continuing professional development for practicing engineers in distribution and transmission system operators.

Handbook of Power Quality

For multi-user PDF licensing, please contact customer service. Energy touches our lives in countless ways and its costs are felt when we fill up at the gas pump, pay our home heating bills, and keep businesses both large and small running. There are long-term costs as well: to the environment, as natural resources are depleted and pollution contributes to global climate change, and to national security and independence, as many of the world's current energy sources are increasingly concentrated in geopolitically unstable regions. The country's challenge is to develop an energy portfolio that addresses these concerns while still providing sufficient, affordable energy reserves for the nation. The United States has enormous resources to put behind solutions to this energy challenge; the dilemma is to identify which solutions are the right ones. Before deciding which energy technologies to develop, and on what timeline, we need to understand them better. America's Energy Future analyzes the potential of a wide range of technologies for generation, distribution, and conservation of energy. This book considers technologies to increase energy efficiency, coal-fired power generation, nuclear power, renewable energy, oil and natural gas, and alternative transportation fuels. It offers a detailed assessment of the associated impacts and projected costs of implementing each technology and categorizes them into three time frames for implementation.

Power Quality

This book presents integrated optimization methods and algorithms for power system problems along with their codes in

MATLAB. Providing a reliable and secure power and energy system is one of the main challenges of the new era. Due to the nonlinear multi-objective nature of these problems, the traditional methods are not suitable approaches for solving large-scale power system operation dilemmas. The integration of optimization algorithms into power systems has been discussed in several textbooks, but this is the first to include the integration methods and the developed codes. As such, it is a useful resource for undergraduate and graduate students, researchers and engineers trying to solve power and energy optimization problems using modern technical and intelligent systems based on theory and application case studies. It is expected that readers have a basic mathematical background.

Power Quality

The two-volume set (LNCS 6728 and 6729) constitutes the refereed proceedings of the International Conference on Swarm Intelligence, ICSI 2011, held in Chongqing, China, in June 2011. The 143 revised full papers presented were carefully reviewed and selected from 298 submissions. The papers are organized in topical sections on theoretical analysis of swarm intelligence algorithms, particle swarm optimization, applications of pso algorithms, ant colony optimization algorithms, bee colony algorithms, novel swarm-based optimization algorithms, artificial immune system, differential evolution, neural networks, genetic algorithms, evolutionary computation, fuzzy methods, and hybrid algorithms - for part I. Topics addressed in part II are such as multi-objective optimization algorithms, multi-robot, swarm-robot, and multi-agent systems, data mining methods, machine learning methods, feature selection algorithms, pattern recognition methods, intelligent control, other optimization algorithms and applications, data fusion and swarm intelligence, as well as fish school search - foundations and applications.

Practical Power Distribution for Industry

Power Quality in Power Systems and Electrical Machines, Second Edition helps readers understand the causes and effects of power quality problems and provides techniques to mitigate these problems. Power quality is a measure of deviations in supply systems and their components, and affects all connected electrical and electronic equipment, including computers, TV monitors, and lighting. In this book analytical and measuring techniques are applied to power quality problems as they occur in central power stations and distributed generation such as alternative power systems. Provides theoretical and practical insight into power quality problems; most books available are either geared to theory or practice only Problems and solutions at the end of each chapter dealing with practical applications Includes application examples implemented in SPICE, Mathematica, and MATLAB

Reactive Power Compensation

Active Power Line Conditioners: Design, Simulation and Implementation for Improving Power Quality presents a rigorous theoretical and practical approach to active power line conditioners, one of the subjects of most interest in the field of power quality. Its broad approach offers a journey that will allow power engineering professionals, researchers, and graduate students to learn more about the latest landmarks on the different APLC configurations for load active compensation. By introducing the issues and equipment needs that arise when correcting the lack of power quality in power grids, this book helps define power terms according to the IEEE Standard 1459. Detailed chapters discuss instantaneous reactive power theory and the theoretical framework that enabled the practical development of APLCs, in both its original and modified formulations, along with other proposals. Different APLCs configurations for load compensation are explored, including shunt APF, series APF, hybrid APF, and shunt combined with series APF, also known as UPQC. The book includes simulation examples carefully developed and ready for download from the book's companion website, along with different case studies where real APLCs have been developed. Finally, the new paradigm brought by the emergence of distribution systems with dispersed generation, such as the use of small power units based on gas technology or renewable energy sources, is discussed in a chapter where mitigation technologies are addressed in a distributed environment. Combines the development of theories, control strategies, and the most widespread practical implementations of active power line conditioners, along with the most recent new approaches Details updated and practical content on periodic disturbances mitigation technologies with special emphasis on distributed generation systems Includes over 28 practical simulation examples in Matlab-Simulink which are available for download at the book's companion website, with 4 reproducible case studies from real APLCs

Reactive Power Compensation

Chapter 1: System Studies -- Chapter 2: Drawings and Diagrams -- Chapter 3: Substation Layouts -- Chapter 4: Substation Auxiliary Power Supplies -- Chapter 5: Current and Voltage Transformers -- Chapter 6: Insulators -- Chapter 7: Substation Building Services -- Chapter 8: Earthing and Bonding -- Chapter 9: Insulation Co-ordination -- Chapter 10: Relay Protection -- Chapter 11: Fuses and Miniature Circuit Breakers -- Chapter 12: Cables -- Chapter 13: Switchgear -- Chapter 14: Power Transformers -- Chapter 15: Substation and Overhead Line Foundations -- Chapter 16: Overhead Line Routing -- Chapter 17: Structures, Towers and Poles -- Chapter 18: Overhead Line Conductor and Technical Specifications -- Chapter 19: Testing and Commissioning -- Chapter 20: Electromagnetic Compatibility -- Chapter 21: Supervisory Control and Data Acquisition -- Chapter 22: Project Management -- Chapter 23: Distribution Planning -- Chapter 24: Power Quality- Harmonics in Power Systems -- Chapter 25: Power Qual

Transmission & Distribution

POWER SYSTEM OPTIMIZATION

Power Quality in Power Systems and Electrical Machines

Power System Optimization is intended to introduce the methods of multi-objective optimization in integrated electric power system operation, covering economic, environmental, security and risk aspects as well. Evolutionary algorithms which mimic natural evolutionary principles to constitute random search and optimization procedures are appended in this new edition to solve generation scheduling problems. Written in a student-friendly style, the book provides simple and understandable basic computational concepts and algorithms used in generation scheduling so that the readers can develop their own programs in any high-level programming language. This clear, logical overview of generation scheduling in electric power systems permits both students and power engineers to understand and apply optimization on a dependable basis. The book is particularly easy-to-use with sound and consistent terminology and perspective throughout. This edition presents systematic coverage of local and global optimization techniques such as binary- and real-coded genetic algorithms, evolutionary algorithms, particle swarm optimization and differential evolutionary algorithms. The economic dispatch problem presented, considers higher-order nonlinearities and discontinuities in input-output characteristics in fossil fuel burning plants due to valve-point loading, ramp-rate limits and prohibited operating zones. Search optimization techniques presented are those which participate efficiently in decision making to solve the multiobjective optimization problems. Stochastic optimal generation scheduling is also updated in the new edition. Generalized Z-bus distribution factors (GZBDF) are presented to compute the active and reactive power flow on transmission lines. The interactive decision making methodology based on fuzzy set theory, in order to determine the optimal generation allocation to committed generating units, is also discussed. This book is intended to meet the needs of a diverse range of groups interested in the application of optimization techniques to power system operation. It requires only an elementary knowledge of numerical techniques and matrix operation to understand most of the topics. It is designed to serve as a textbook for postgraduate electrical engineering students, as well as a reference for faculty, researchers, and power engineers interested in the use of optimization as a tool for reliable and secure economic operation of power systems. Key Features The book discusses : Load flow techniques and economic dispatch—both classical and rigorous Economic dispatch considering valve-point loading, ramp-rate limits and prohibited operating zones Real coded genetic algorithms for economic dispatch Evolutionary programming for economic dispatch Particle swarm optimization for economic dispatch Differential evolutionary algorithm for economic dispatch Stochastic multiobjective thermal power dispatch with security Generalized Z-bus distribution factors to compute line flow Stochastic multiobjective hydrothermal generation scheduling Multiobjective thermal power dispatch using artificial neural networks Fuzzy multiobjective generation scheduling Multiobjective generation scheduling by searching weight pattern

Transmission And Distribution Of Electrical Power

Power systems have two components of apparent power: active and reactive power. Both components are necessary for functioning of electrical systems. The active power is the average power absorbed by the resistive load. The reactive power is the measure of energy exchange between the source and reactive power of load. Energy storage devices do not dissipate or supply power, but exchange power with the rest of system. Active power is the one that is converted to other forms of energy in the load yet reactive power is only responsible for magnetizing purposes. Power factor is a ratio depicting how much of the power supplied is real. The reactive current contribute in the value of the overall magnitude of current in transmission lines causing unnecessarily high line currents and low power factor. Since a low power factor means higher amount of apparent power need to be supplied by the utility company, thus the company must also use bigger generators, large transformers and thicker transmission/distribution lines. This requires a higher capital expenditure and operational cost which usually result in the cost being passed to the consumer. In this research, we seek to identify the effects of a low power factor on Swaziland Electricity Company's power supply system and recommend possible solutions to the problem. The results are useful in determining how to optimally deliver power to a load at a power factor that is reasonably close to unity, thus reducing the utility's operational costs while increasing the quality of the service being supplied. The book consists from the following chapters: ABSTRACT CHAPTER 1: INTRODUCTION CHAPTER 2: LITERATURE REVIEW CHAPTER 3: RESEARCH METHODOLOGY CHAPTER 4: DATA COLLECTION CHAPTER 5: RESULTS AND ANALYSIS OF THE SIMULATION MODEL CHAPTER 6: BENEFITS OF POWER FACTOR CORRECTION CHAPTER 7: FINDINGS, RECOMMENDATIONS AND CONCLUSIONS REFERENCES APPENDIXES Appendix A: Load Profiles Appendix B - Substations Appendix C: Simulation Results

Elements of Power System Analysis

A static compensator (STATCOM), also known as static synchronous compensator, is a member of the flexible alternating current transmission system (FACTS) devices. It is a power-electronics based regulating device which is composed of a voltage source converter (VSC) and is shunt-connected to alternating current electricity transmission and distribution networks. The voltage source is created from a DC capacitor and the STATCOM can exchange reactive power with the network. It can also supply some active power to the network, if a DC source of power is connected across the capacitor. A STATCOM is usually installed in the electric networks with poor power factor or poor voltage regulation to improve these problems. In addition, it is used to improve the voltage stability of a network. This book covers STATCOMs from different aspects. Different converter topologies, output filters and modulation techniques utilized within STATCOMs are reviewed. Mathematical modeling of STATCOM is presented in detail and different STATCOM control strategies and algorithms are discussed. Modified load flow calculations for a power system in the presence of STATCOMs are presented. Several

applications of STATCOMs in transmission and distribution networks are discussed in different examples and optimization techniques for defining the optimal location and ratings of the STATCOMs in power systems are reviewed. Finally, the performance of the network protection scheme in the presence of STATCOMs is described. This book will be an excellent resource for postgraduate students and researchers interested in grasping the knowledge on STATCOMs.

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