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Description: Simulating Phase change and thermal ablation Thermal behaviour in high speed rotating equipment Joule heating under various electrical loads Laser system with ray-tracing Thermal ...

This book presents a comprehensive set of guidelines and applications of DigSILENT PowerFactory, an advanced power system simulation software package, for different types of power systems studies. Written by specialists in the field, it combines expertise and years of experience in the use of DigSILENT PowerFactory with a deep understanding of power systems analysis. These complementary approaches therefore provide a fresh perspective on how to model, simulate and analyse power systems. It presents methodological approaches for modelling of system components, including both classical and non-conventional devices used in generation, transmission and distribution systems, discussing relevant assumptions and implications on performance assessment. This background is complemented with several guidelines for advanced use of DSL and DPL languages as well as for interfacing with other software packages, which is of great value for creating and performing different types of steady-state and dynamic performance simulation analysis. All employed test case studies are provided as supporting material to the reader to ease recreation of all examples presented in the book as well as to facilitate their use in other cases related to planning and operation studies. Providing an invaluable resource for the formal instruction of power system undergraduate/postgraduate students, this book is also a useful reference for engineers working in power system operation and planning.

This book consolidates some of the most promising advanced smart grid functionalities and provides a comprehensive set of guidelines for their implementation/evaluation using DigSILENT Power Factory. It includes specific aspects of modeling, simulation and analysis, for example wide-area monitoring, visualization and control, dynamic capability rating, real-time load measurement and management, interfaces and co-simulation for modeling and simulation of hybrid systems. It also presents key advanced features of modeling and automation of calculations using PowerFactory, such as the use of domain-specific (DSL) and DigSILENT Programming (DPL) languages, and utilizes a variety of methodologies including theoretical explanations, practical examples and guidelines. Providing a concise compilation of significant outcomes by experienced users and developers of this program, it is a valuable resource for postgraduate students and engineers working in power-system operation and planning.

This book provides an overview of power electronic converters for numerical simulations based on DigSILENT PowerFactory. It covers the working principles, key assumptions and implementation of models of different types of these power systems. The book is divided into three main parts: the first discusses high-voltage direct currents, while the second part examines distribution systems and micro-grids. Lastly, the third addresses the equipment and technologies used in modelling and simulation. Each chapter includes practical examples and exercises, and the accompanying software illustrates essential models, principles and performance using DigSILENT PowerFactory. Exploring various current topics in the field of modelling power systems, this book will appeal to a variety of readers, ranging from students to practitioners.

This book is an open access book. This book provides an overview of the ERIGrid validation methodology for validating CPES, a holistic power system testing method. It introduces readers to corresponding simulation and laboratory-based tools, including co-simulation, real-time simulation, and hardware-in-the-loop. Selected test cases and validation examples are provided, in order to support the theory discussed. The book begins with an introduction to current power system testing methods and an overview of the ERIGrid system-level validation approach. It then moves on to discuss various validation methods, concepts and tools, including simulation and laboratory-based assessment methods. The book presents test cases and validation examples of the proposed methodologies and summarises the lessons learned from the holistic validation approach. In the final section of the book, the educational aspects of these methods, the outlook for the future, and overall conclusions are discussed. Given its scope, the book will be of interest to researchers, engineers, and laboratory personnel in the fields of power systems and smart grids, as well as undergraduate and graduate students studying related engineering topics.

This book evaluates a number of serious technical challenges related to the integration of renewable energy sources into the power grid using the DigSILENT PowerFactory power system simulation software package. It provides a fresh perspective on analyzing power systems according to renewable energy sources and how they affect power system performance in various situations. The book examines load flow, short-circuit, RMS simulation, power quality, and system reliability in the presence of renewable energy sources, and presents readers with the tools needed for modeling, simulation, and analysis for network planning. The book is a valuable resource for researchers, engineers, and students working to solve power system problems in the presence of renewable energy sources in power system operations and utilities.

Electric power systems around the world are changing in terms of structure, operation, management and ownership due to technical, financial, and ideological reasons. Power systems keep on expanding in terms of geographical areas, asset additions, and the penetration of new technologies in generation, transmission, and distribution. The conventional methods for solving the power system design, planning, operation, and control problems have been extensively used for different applications, but these methods suffer from several difficulties, thus providing suboptimal solutions. Computationally intelligent methods can offer better solutions for several conditions and are being widely applied in electrical engineering applications. This Special Issue represents a thorough treatment of computational intelligence from an electrical power system engineer's perspective. Thorough, well-organised, and up-to-date, it examines in detail some of the important aspects of this very exciting and rapidly emerging technology, including machine learning, particle swarm optimization, genetic algorithms, and deep learning systems. Written in a concise and flowing manner by experts in the area of electrical power systems who have experience in the application of computational intelligence for solving many complex and difficult power system problems, this Special Issue is ideal for professional engineers and postgraduate students entering this exciting field.

Offering an up-to-date account of the strategies utilized in state estimation of electric power systems, this text provides a broad overview of power system operation and the role of state estimation in overall energy management. It uses an abundance of examples, models, tables, and guidelines to clearly examine new aspects of state estimation, the testing of network observability, and methods to assure computational efficiency. Includes numerous tutorial examples that fully analyze problems posed by the inclusion of current measurements in existing state estimators and illustrate practical solutions to these challenges. Written by two expert researchers in the field, Power System State Estimation extensively details topics never before covered in depth in any other text, including novel robust state estimation methods, estimation of parameter and topology errors, and the use of ampere measurements for state estimation. It introduces various methods and computational issues involved in the formulation and implementation of the weighted least squares (WLS) approach, presents statistical tests for the detection and identification of bad data in system measurements, and reveals alternative topological and numerical formulations for the network observability problem.

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.

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