1. Record Nr. UNINA9910878078303321

Autore	Palanisamy Sivaraman
Titolo	Microgrids for Commercial Systems
Pubbl/distr/stampa	Newark : , : John Wiley & Sons, Incorporated, , 2024 ©2024
ISBN	9781394167302 139416730X 9781394167319 1394167318
Edizione	[1st ed.]
Descrizione fisica	1 online resource (479 pages)
Altri autori (Persone)	ChenniappanSharmeela PadmanabanSanjeevikumar
Soggetti	Microgrids (Smart power grids) Renewable energy sources
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Cover -- Title Page -- Copyright Page -- Contents -- Acknowledgements -- Chapter 1 Smart Energy Source Management in a Commercial Building Microgrid -- 1.1 Introduction -- 1.2 Motivations of the Study -- 1.3 State of the Art of the System -- 1.4 Overview of the Proposed Methodology -- 1.5 DSM Approach -- 1.6 Background for HOMER Simulation -- 1.6.1 Economical Input Data for Simulation -- 1.6.2 Simulation-Energy Configurations -- 1.6.3 Comparative Analysis -- 1.6.4 Highlights of the Proposed Framework -- 1.7 Conclusion -- References -- Chapter 2 Renewable Power Generation Price Prediction and Forecasting Using Machine Learning -- 2.1 Introduction -- 2.1.1 Electricity Price Forecasting -- 2.1.2 Electricity Price Classification -- 2.1.3 Price Spike Prediction -- 2.2 Literature Review -- 2.2.1 Types of Analyses -- 2.2.1.1 Game Theory Models -- 2.2.1.2 Model Simulations -- 2.2.1.3 Models for Time Series -- 2.2.1.4 Parsimonious Stochastic Models -- 2.2.1.5 Regression or Causal Models -- 2.3 Data Mining Models -- 2.3.1 Machine Learning Techniques -- 2.3.1.1 Supervised Learning -- 2.3.2 Decision Trees -- 2.4 Objectives -- 2.4.1 Forecasting Results for the Seasons of Indian Market -- 2.4.2 Day-Ahead

Forecasting of Prices for the Indian Market -- 2.4.2.1 Forecasts of Cases A and B -- 2.5 Conclusions -- References -- Chapter 3 Energy Storage System for Microgrid for Commercial Systems -- 3.1 Introduction -- 3.2 State of the Art -- 3.2.1 History of Energy Storage Systems -- 3.2.2 Significance of Power Electronics-Based Systems in Energy Storage -- 3.2.3 Recent Developments in Storage Systems for Microgrids -- 3.3 Energy Storage Systems -- 3.3.1 Definition and Classification -- 3.3.2 Sizing of Primary Storage -- 3.3.3 Supplementary Storage -- 3.3.4 Control Strategies -- 3.4 Batteries for Microgrids in Commercial Applications -- 3.4.1 Battery Chemistry.
3.4.2 Modeling and Simulation of Batteries -- 3.4.3 Battery Management System -- 3.5 Future Trends -- 3.5.1 Energy Storage System Challenges -- 3.5.2 Technological Advancements -- 3.6 Summary -- References -- Chapter 4 Emerging Topologies of DC-DC Converters for Microgrid Applications -- 4.1 Introduction -- 4.2 Microgrid -- 4.3 DC-DC Converter Topologies -- 4.4 Modulation of DC-DC Converters With Different Control Strategies -- 4.5 Comparative Analysis -- 4.6 Conclusion -- Appendix -- References -- Chapter 5 Analysis of PWM Techniques on Multiphase Multilevel Inverter for PV Applications in Microgrids -- 5.1 Introduction -- 5.2 Cascaded H-Bridge Multiphase Multilevel Inverter -- 5.3 Modulation Techniques for Multilevel Inverter -- 5.3.1 High Switching Frequency PWM Technique -- 5.3.1.1 Phase-Shifted Modulation (PSM) -- 5.3.1.2 Level-Shifted Modulation (LS-PWM) -- 5.3.2 Sinusoidal PWM -- 5.3.3 Harmonic Injection -- 5.3.4 Switching Frequency Optimal -- 5.4 Simulation Results -- 5.5 Conclusion -- References -- Chapter 6 Mathematical Modeling and Analysis of Solar PV-Electrolyzer-Fuel Cell-Based Power Generation System -- 6.1 Introduction -- 6.2 Hybrid Renewable Energy Storage System -- 6.3 Modeling of the Hybrid Renewable Energy Storage System -- 6.3.1 PV Panels -- 6.3.2 PEM Electrolyzer -- 6.3.3 Hydrogen Storage Tank -- 6.3.4 PEM Fuel Cell -- 6.4 Characteristic Study of Each Component of the Hybrid Renewable Energy Storage System -- 6.4.1 Solar PV Panel -- 6.4.2 PEM Electrolyzer -- 6.4.3 PEM Fuel Cell -- 6.5 Energy Management System -- 6.6 Result and Discussion -- 6.7 Summary and Future Scope -- References -- Chapter 7 Design of DC EV Charging Infrastructure in a Commercial Building Using the Solar PV System -- 7.1 Introduction -- 7.2 Methodological Analysis -- 7.2.1 System Configuration -- 7.2.2 Site Location in Environmental Aspects.
7.2.3 Electrical Load Parameters -- 7.2.4 Component Specification Parameters -- 7.3 Result Analysis -- 7.3.1 Proposed System Cost Benefits -- 7.3.2 Electrical Analysis -- 7.3.3 Grid and Solar PV Comparison -- 7.3.4 Grid Bill Comparison -- 7.3.5 Electric Vehicle State of Charge Analysis -- 7.3.6 Emission Analysis -- 7.4 Conclusion -- References -- Chapter 8 Design and Simulation of a Rooftop Stand-Alone Photovoltaic Power System for an Academic Institution -- 8.1 Introduction -- 8.2 System Design -- 8.2.1 Size of the PV Module -- 8.2.2 Battery Sizing -- 8.2.3 Charge Controller -- 8.2.4 Inverter Sizing -- 8.3 Design Methodology -- 8.3.1 Meteorological Information of the Site -- 8.3.2 Daily Load Calculation -- 8.3.3 Cost Analysis -- 8.4 Conclusion -- References -- Chapter 9 Integration of Wind Energy Control with Electric Vehicle -- 9.1 Introduction -- 9.2 PID Controller -- 9.2.1 Proportional Action -- 9.2.2 Integral Action -- 9.2.3 Derivative Action -- 9.2.4 PID Controller Design and Tuning -- 9.2.5 PID Controller Design -- 9.3 Wind Power System Dynamics -- 9.3.1 Wind Turbine Characteristics -- 9.3.2 Wind Power Output Fluctuations -- 9.3.3 Frequency Deviation in Wind Power Systems -- 9.4 PID Control in Frequency Regulation -- 9.4.1 PID Control for Output Power Control --

9.4.2 PID Controller Parameters and Tuning -- 9.4.3 Optimization of PID Parameter -- 9.4.4 Frequency Deviation With and Without PID Control -- 9.5 Integrating Wind Power Systems into EV -- 9.6 Conclusion -- References -- Chapter 10 Interactive Use of D-STATCOM and Storage Resource to Maintain Microgrid Stability for Commercial Systems -- 10.1 Introduction -- 10.1.1 Microgrid Concept -- 10.1.2 Review of Past Works -- 10.2 The Proposed Structure -- 10.2.1 Primary Controller -- 10.2.1.1 Drop Controller -- 10.2.1.2 Voltage Controller -- 10.2.1.3 Current Controller.
10.2.2 Secondary Control -- 10.2.2.1 Static Compensation of Microgrid Based on Inverter -- 10.3 Simulation -- 10.3.1 Commercial LV Distribution Network -- 10.3.2 Test No. 1: Changing the State of the Microgrid from Connected to Island -- 10.3.3 Test No. 2: Adding Demand to the Microgrid -- 10.3.4 Test No. 3: Changes in the Production of Renewable Resources -- 10.4 Conclusion -- References -- Chapter 11 Power System Studies for Microgrids -- 11.1 Introduction -- 11.2 Description of a Microgrid Model Operating in Islanded Mode -- 11.2.1 Load Flow Analysis of a Microgrid Operating in Islanded Mode -- 11.2.1.1 Operating Scenario 1 -- 11.2.1.2 Operating Scenario 2 -- 11.3 Harmonic Load Flow Analysis in Islanded Mode -- 11.4 Transient Analysis of a Microgrid System in Islanded Mode -- 11.4.1 Fault at Main Bus -- 11.4.2 Three-Phase Fault at Main Bus -- 11.4.3 Fault at Bus 3 Connected to Motor Load -- 11.4.4 Loss of One PV Generator in Islanded Mode Operation -- 11.4.5 Critical Clearing Time and Critical Clearing Angle -- 11.5 Load Flow Analysis of a Microgrid Operating in Grid-Tied Mode -- 11.5.1 Operating Scenario 1 -- 11.5.2 Operating Scenario 2 -- 11.5.3 Harmonic Load Flow Analysis in Grid-Tied Mode -- 11.6 Transient Analysis of Microgrid System in Grid-Tied Mode -- 11.6.1 Fault at the Main Bus -- 11.6.2 Three-Phase Fault at the Main Bus -- 11.6.3 Fault at Bus 3 Connected to 3-HP Motor Load -- 11.6.4 Loss of One PV Generator in Grid-Tied Mode Operation -- 11.7 Comparative Analysis of a Microgrid Operating in Islanded and Grid-Tied Mode -- 11.8 Conclusion -- References -- Chapter 12 EV Charging Infrastructure in Microgrid -- 12.1 Introduction -- 12.2 An Overview of EV Charging Infrastructure -- 12.2.1 Charging of Electric Vehicle -- 12.2.2 Electrical Vehicle Charging Categorization -- 12.2.3 Characteristics of Electric Vehicle Supply Equipment.
12.2.4 Smart Charging and Interoperability of Charging -- 12.2.5 Battery Specification in Different EV Segments -- 12.3 Importance of Charging Station and Charge Point -- 12.3.1 Classification of EV Charging Infrastructure -- 12.3.2 Operating Groups for EV Charging Infrastructure -- 12.3.3 Charge Point Operator and E-Mobility Service Providers -- 12.3.4 Availability and Management of Charging Data -- 12.4 EV Integration to the Microgrid -- 12.4.1 EV Charge Connection's Regulatory Framework -- 12.4.2 Electricity Tariff -- 12.4.3 Technical Challenges for DISCOMs -- 12.4.4 Electrical Supply Arrangement for Charging -- 12.5 Industrial Microgrid and Subsystem -- 12.5.1 V2G Frequency Control Method -- 12.5.2 The DC MG Structure -- 12.5.3 EV Charging Optimal Control Strategy -- 12.6 Summary -- References -- Chapter 13 Operation and Control of EV Infrastructure for Microgrid -- 13.1 Introduction -- 13.2 Proposed Electric Vehicle Charging Infrastructure for Enhancing Microgrid Operation -- 13.3 Implementation of Proposed Commercial EV Charging Stations on Microgrids -- 13.4 Validation of the Proposed Commercial EV Charging Stations on Microgrids -- 13.5 Conclusion -- References -- Chapter 14 Renewable-Energy-Powered EV Charging Station for Microgrid PSO. Based Controller for PV-Powered EV Charging Station -- 14.1 Introduction -- 14.2 Renewable-Energy-Powered EV Charging Station

for Microgrid -- 14.3 EV Charging Station -- 14.3.1 Types of EV Charging Station -- 14.3.2 Types of EV Charging Cables -- 14.3.3 Types of EV Charging Modes -- 14.3.4 Types of EV Charger -- 14.4 System Description -- 14.5 Proposed PSO Optimized IC MPPT Algorithm -- 14.5.1 IC MPPT -- 14.5.2 PSO -- 14.5.3 PSO Optimized IC MPPT -- 14.6 Case Study.MATLAB Simulation -- 14.7 Conclusion -- References -- Appendix -- 14.A1 PSO-Optimized MPPT Codings -- 14. A2 Overall System in MATLAB/Simulink.
Chapter 15 Closed-Loop Control of Microgrids With Wind and Battery Storage System in Islanding Mode.

Sommario/riassunto

This book, edited by P. Sivaraman and C. Sharmeela, focuses on the development and management of microgrids for commercial systems, offering insights into smart energy source management, renewable power generation, and energy storage solutions. It covers advanced topics such as DC-DC converters, solar and wind energy integration, and electric vehicle charging infrastructure. Techniques involving machine learning for electricity price forecasting and innovative control strategies for maintaining microgrid stability are also explored. The book is intended for engineers, researchers, and professionals interested in the implementation and optimization of microgrids in commercial environments.