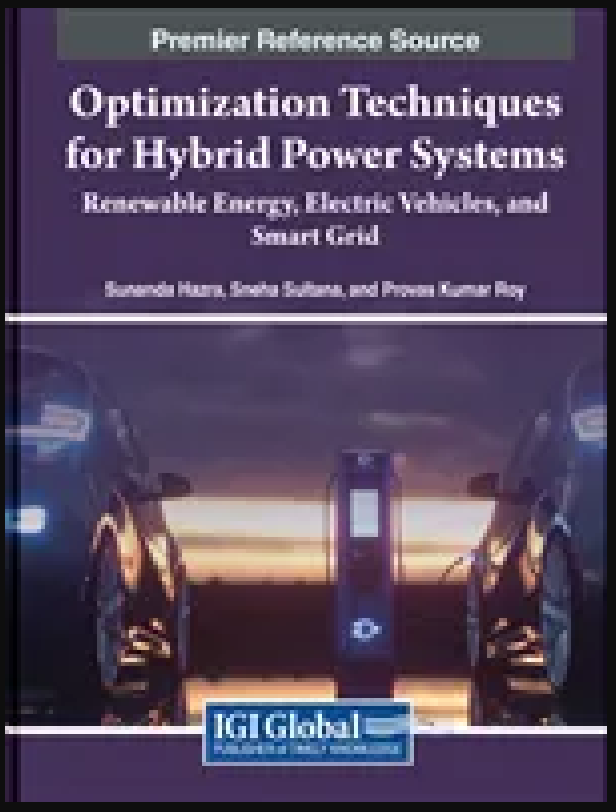
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Optimization Techniques for Hybrid Power Systems
Renewable Energy, Electric Vehicles, and Smart Grid
IGI Global

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Preface

Optimization techniques are fundamental to achieve an efficient and reliable energy management and storage system. Renewable energies are those sources of energy that can be obtained naturally without depleting the planet's resources. Renewable energies are a key alternative to ensure a cleaner and safer future for future generations. Hybrid renewable energy systems are those that combine two or more renewable energy sources to generate electricity. These systems are especially useful in places where there is no access to the conventional electrical grid. Additionally, electric vehicles can be charged from renewable energy sources and actually help in contributing to grid stability by storing wind power in night and solar power in day and in turn help in proliferation of renewable energy and contribute to reducing emissions.

This book has a focus on meta-heuristic optimization methods and it demonstrates how these techniques have revolutionized renewable energy integrated problem-solving and their application in real-world scenarios. It examines the challenges and opportunities in achieving a larger utilization of renewable energy sources to reduce carbon emissions and air pollutants while meeting renewable portfolio standards and enhancing energy efficiency.

This book serves as a valuable resource for researchers, academicians, industry delegates, scientists, and final-year bachelor's/master's degree students.

Chapter 1: In this context, multi-energy based hybrid power system at an industrial city is explained under techno-economic feasibility scenario.

Chapter 2: In the present chapter, the authors introduced Machine Learning and IoT for the advancements of optimizing smart Energy Systems through smart grid integration.

Chapter 3: The aim of this work is to implement optimization, simulation of five fractional-order low pass filter transfer functions using CCII+.

Chapter 4: This chapter describes the performance of microturbine in a microgrid in comparison with fuel cell.

Chapter 5: In this chapter, wind data pattern and trend analysis are explained using feature identification and extreme wind speed prediction.

Chapter 6: This chapter presents an overview of energy cascade conversion system and energy-efficient infrastructure.

Chapter 7: The aim of this work is to design optimal tuning of single input power system stabilizer using quasi-oppositional butterfly optimization algorithm.

Chapter 8: This chapter illustrates the effective planning of renewable energy system using machine learning approach.

Chapter 9: This chapter presents the performance evaluation of a low head hydraulic air compressor for a prospective source of renewable and green energy.

Chapter 10: This chapter describe proficient dynamic ED solution with V2G integration along with renewable sources.

Chapter 11: This chapter describes the structured methods to increase the lifetime of mechanical products by parametric accelerated life testing.

Chapter 12: In this chapter, electromagnetic energy harvesting technologies of roadways is used for harnessing sustainable power from traffic.

Chapter 13: This chapter presents particle swarm optimization based MPPT for PV applications and also its comparison with incremental conductance method is described.

Chapter 14: The aim of this work is to design, modeling, simulation and comparison of different converter topologies for MPPT techniques.

Chapter 15: This chapter illustrates the sustainable hybrid power system and its future application for electric vehicles, and smart grid.

Chapter 16: In the present chapter, the authors present a review of various technologies for increasing energy efficiency.

Chapter 17: The aim of this work is to apply demand side management in smart grid using day ahead load-shifting strategy by incorporating meta-heuristic optimization algorithm.

Chapter 18: This chapter describes the novel power generation technology based on renewable energy.

Chapter 19: In this chapter, advancement in power generation using AI software tools is described.

This book is explored as a crucial recipe for modern power system processes and management. The integration of energy storage, distributed generation, demand response technologies into electric distribution and transmission systems is examined in detail. The book also emphasizes the importance of smart-grid technology, electric vehicle (EV), artificial intelligence (AI), machine learning (ML) and advanced multi-energy systems in achieving sustainability and carbon neutrality.

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