

Preface

Smart grid is regarded as the next-generation power grid, which implements an innovative idea for a highly automated and integrated power system. In the smart grid environment, microgrid is regarded as one of the important components, which features the integration of distributed generation from renewable energy sources, and the islanded and connected operation. As a new grid paradigm and a smart grid application, microgrid brings about many benefits as well as challenges. Among the new challenges, energy management or distribution is considered as one of the most important problems. The research on smart grid covers many challenging and interesting topics, while this book, however, is mainly focused on energy management in the microgrid environment. The main motivation of the book is to explore the power distribution schemes in grid-connected microgrids, aiming to smooth the grid load peak while keeping power users' utility at a satisfactory level and controlling the cost in the entire power system.

We begin from a detailed introduction of smart grid, and provide readers with a review of important technologies and techniques applied in smart grid as well as microgrid. We then present an optimal energy distribution strategy for connected microgrids in a smart grid environment, which features a detailed analysis of the mathematical techniques of convex optimization and online algorithms. This text provides readers with essential content on how to achieve multiobjective optimization that takes into consideration power customers, energy providers, and grid smoothing in connected microgrids. Featuring detailed theoretical proofs and simulation results that demonstrate and evaluate the correctness and effectiveness of the algorithm, this book then explains step-by-step how the problem can be reformulated and solved, and how to achieve the distributed online algorithm on the basis of a centralized offline algorithm. Special attention is paid on how to apply this algorithm in practical cases and the possible future trends of energy management in microgrids. This book can also be used as a valuable guide to help researchers and students better understand the concept of microgrid and the energy management in microgrids for different cases.

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