

Preface

The electrical power grid is often referred to as one of the most complex man-made systems on Earth. Its importance to all aspects of our daily lives, economic stability, and national security cannot be overstated, and the need for an updated, secure, resilient, and smarter power grid infrastructure is increasingly recognized and supported by policy makers and market forces.

The promise of a smarter electrical grid is likely to be one the most important transformational changes in our national power infrastructure. This could significantly affect how consumers use and pay for their electrical power, thus fundamentally changing the power industry that we know today.

Smart Grid technologies combine power generation and delivery systems with advanced communication systems to help save energy, reduce energy costs, and improve reliability. The combination of these technologies enable new approaches for load balancing and power distribution, allowing for optimal runtime power routing, and cost management. Such unprecedented capabilities, however, also introduce new sets of challenges at the technical and regulatory levels that must be addressed by the industry and the research community. This book, organized as a part of the workshop ‘Systems and Optimization Aspects of Smart Grid Challenges’ brings together a number of perspectives and approaches to smart grid challenges and optimization.

This book primarily covers both the optimization and the security aspects of smart grid technologies. From a control and optimization perspective, the book includes chapters on unit commitment, homeostatic control, flexible demands, and others. From a cyber security perspective, the book includes chapters on secure sensor measurements, temper detection, and proposed approaches to trustworthy architectures, among others. These articles address some of the many important aspects in smart grids control and optimization research.

We would like to express our gratitude to all the reviewers and contributing authors for offering their expertise and providing valuable material used to compose this volume. We thank Springer for the opportunity to make a contribution in advancing and sharing the state-of-the-art research in smart grid technologies.

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