

1. Record Nr.	UNINA9910460243103321
Titolo	Energy storage for smart grids : planning and operation for renewable and variable energy resources (VERs) // edited by Pengwei Du, Ning Lu ; contributors, Hossein Akhavan-Hejazi [and twenty-six others]
Pubbl/distr/stampa	London, [England] : , : Academic Press, , 2015 ©2015
ISBN	0-12-409543-7
Edizione	[First edition.]
Descrizione fisica	1 online resource (346 p.)
Disciplina	621.31/26
Soggetti	Smart power grids Energy storage Electronic books.
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references at the end of each chapters and index.
Nota di contenuto	Front Cover; Energy Storage for Smart Grids: Planning and Operation for Renewable and Variable Energy Resources (VERs); Copyright; Contents; Contributors; Preface; Chapter 1: Energy Storage for Mitigating the Variability of Renewable Electricity Sources; 1. Introduction; 2. An Overview of Variable Renewable Electricity Sources; 3. Electric Energy-Storage Applications and Technologies; 3.1. Pumped Hydro Storage; 3.2. Compressed Air Energy Storage; 3.3. Batteries; 3.3.1. Lead-Acid Batteries; 3.3.2. Nickel-Cadmium Batteries; 3.3.3. Sodium-Sulphur Batteries; 3.3.4. Lithium-ion batteries; 3.3.5. Zinc-Bromine Batteries; 3.3.6. Vanadium Redox Batteries; 3.4. Superconducting Magnetic Energy Storage; 3.5. Hydrogen Storage; 3.6. Flywheels; 3.7. Capacitors and Supercapacitors; 4. Discussion; 4.1. Managing VRES variability using EES; 4.1.1. Power Quality; 4.1.2. Regulation; 4.1.3. Load following; 4.1.4. Unit commitment; 4.1.5. Seasonal storage; 4.2. Managing the Distributed Nature of VRES; 4.3. EES Development Potential; 5. Conclusion; Acknowledgments; References; Chapter 2: Assessment of Revenue Potentials of Ancillary Service Provision by Flexible Unit Portfolios 1. Introduction and Literature Review 2. Aggregators in Electricity

Markets; 2.1. The Role of Aggregators; 2.2. Distribution-Grid Constraints; 2.3. Unit-Monitoring Challenges; 3. Modeling of Revenue Potential; 3.1. Regulatory Basis for Revenue Calculation; 3.2. Net-Operating Profit; 4. Simulation Study; 4.1. Simulation Scenarios; 4.2. Numerical Results; Primary Control with Portfolio A; Primary Control with Portfolio B; Secondary Control with Portfolio A; Secondary Control with Portfolio B; 5. Profit-Sharing Methodology; 5.1. Business Value Model; 5.2. Actors and Activities; 5.3. Exchanges

5.4. Cash-Flow Consolidation5.5. Application Example; 6. Concluding Remarks; References; Chapter 3: Potential of Sodium-Sulfur Battery Energy Storage to Enable Further Integration of Wind; 1. Introduction; 2. Energy storage as an alternative; 2.1. Energy storage in electricity markets; 3. Sodium-Sulfur battery energy storage; 3.1. Principle; 3.2. Target applications and existing installations; 3.3. The Sodium-Sulfur battery at Luverne, Minnesota; 3.3.1. Emulation of different storage-to-wind ratios; 4. Generation shifting; 4.1. Charging/discharging simulation

4.1.1. Charging/discharging intervals4.1.2. Effect of storage-to-wind ratio on the battery SOC; 4.2. Analysis of the value added by storage; 4.2.1. Procedure; 4.2.2. Results; 4.2.3. Discussion on an optimal storage-to-wind ratio; 5. Ramp-rate limiting; 5.1. Low-pass filter to limit ramp rate; 5.2. Field results and extended simulation; 5.3. Simulation results; 6. Integrating generation shifting and ramp-rate limiting; 7. Concluding remarks; Acknowledgments; References; Chapter 4: Application of Energy Storage for Fast Regulation Service in Energy Market; 1. Introduction

2. Overview of Secondary Regulation Control

Sommario/riassunto

Energy storage is a main component of any holistic consideration of smart grids, particularly when incorporating power derived from variable, distributed and renewable energy resources. Energy Storage for Smart Grids delves into detailed coverage of the entire spectrum of available and emerging storage technologies, presented in the context of economic and practical considerations. Featuring the latest research findings from the world's foremost energy storage experts, complete with data analysis, field tests, and simulation results, this book helps device manufacturers develop robust busi
