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Nota di contenuto	Intro -- Energy Storage Technologies and Applications -- Contents -- Foreword -- Preface -- Acknowledgments -- Chapter 1 A Brief History of Storing Energy Using Electricity -- 1.1Bottled Electricity: First Attempts to Capture Electrical Energy -- 1.2Primary Battery Developments -- 1.3Early Battery Applications -- 1.4Secondary Rechargeable Batteries -- 1.5Electrified Transportation -- 1.6 Storage in Electricity Distribution -- 1.7Pumped Hydro Energy Storage -- 1.8Growth of Hydro-Based Storage and Generation -- 1.9 Compressed-Air Energy Storage -- 1.10Return of Battery-Based Energy Storage -- 1.10.1Lithium-Ion Batteries -- 1.11Going Forward -- References -- Additional References and Useful Links -- Chapter 2 Applications of Energy Storage on the Grid -- 2.1Why Does the Grid Need Energy Storage? -- 2.1.1Inertial Support -- 2.1.2 Frequency Services -- 2.1.3Renewable Energy Integration -- 2.1.4 Energy Shifting -- 2.1.5Transmission and Distribution -- 2.1.6 Demand Charge Management -- 2.1.7Power Quality -- 2.1.8 Resiliency -- 2.2How Much Energy Storage is Necessary? -- References -- Appendix 2A -- AC versus DC -- Chapter 3 Mechanical Energy Storage -- 3.1Kinetic Energy Storage -- 3.1.1The Fundamentals -- 3.1.2Beacon Power -- 3.1.3Flywheels for Frequency Regulation -- 3.1.4Flywheel Summary -- 3.2Potential Energy Storage -- 3.2.1Gravitricity's Weights on a Cable -- 3.2.2 Gravity Power's Floating Piston -- 3.2.3Energy Vault's Stack of Blocks -- 3.2.4Summary of Potential Energy Storage Systems -- 3.3

Mechanical Energy Storage Summary -- Additional References and Useful Links -- Chapter 4 Hydroelectric Energy Storage -- 4.1The Basics -- 4.2Massive Scale -- 4.3Environmental Impact -- 4.4The Muscle in the Works -- 4.4.1How Much Power Can a Turbine Produce? -- 4.4.2Height and Flow -- 4.5Examples of Pumped Hydro Storage.
4.6PHS Applications -- 4.6.1Bulk Energy Storage -- 4.6.2 Seasonal Energy Storage -- 4.6.3Short-Term Energy Storage and Grid Services -- 4.7Summary of Pumped Hydro Storage -- References -- Appendix 4A -- Chapter 5 Thermodynamic Energy Storage -- 5.1 CAES -- 5.1.1Compressing Air -- 5.1.2Decompressing Air -- 5.1.3 Examples of CAES Plants -- 5.1.4Siting CAES -- 5.1.6Controlling CAES -- 5.1.7Summary of Compressed Air Energy Storage -- 5.2 Thermal Energy Storage -- 5.2.1Sensible Thermal Energy -- 5.2.2 Latent Heat Storage -- 5.3Thermochemical Storage -- 5.4Summary of Thermal Energy Storage -- References -- Appendix 5A -- Chapter 6 Electrochemical Energy Storage -- 6.1Six Critical Components of a Battery Cell -- 6.2Battery Energy Storage Architecture -- 6.3Battery Chemistries -- 6.3.1Lead-Acid -- 6.3.2Nickel-Cadmium -- 6.3.3 Nickel-Metal Hydride -- 6.3.4Lithium-Ion -- 6.3.5Sodium-Sulfur Batteries -- 6.3.6Flow Batteries -- 6.3.7Vanadium Redox Flow Battery -- 6.3.8Zinc-Bromine -- 6.3.9All Iron Flow Battery -- 6.3.10Zinc Batteries -- 6.3.11Zinc Manganese Dioxide -- 6.3.12 Sodium-Ion Batteries -- 6.3.13Liquid Metal Batteries -- 6.3.14 Nickel-Iron -- 6.3.15Electrochemical Supercapacitors -- 6.4 Summary of Electrochemical Energy Storage -- 6.5Summary of Other Chemistries -- References -- Chapter 7 The Value of Energy Storage -- 7.1Levelized Cost of Energy -- 7.2Levelized Cost of Storage -- 7.3 Levelized Cost of Using Storage -- 7.3.1Up-Front Capex -- 7.3.2 Operating Costs -- 7.3.3Summary of Costs -- 7.3.4Delivered Energy Basis -- 7.3.5Simple LCUS Exercises -- 7.3.6Applications of Energy Storage that Make Cents -- 7.3.7Sum of the Parts -- 7.4 Concluding Remarks -- References -- List of Acronyms, Constants, and Terms -- About the Author -- Index.

Sommario/riassunto

This book provides a broad look at all different energy storage technologies, from the past and into the future. It takes a hard look at the advantages and disadvantages of various technologies, but also the different applications of energy storage to determine the attributes that are most important for the technology one would choose for them. The book guides you through the hidden costs and true advantages of today's energy storage technologies, and helps you understand energy storage technologies' specifications and claims to uncover which are important to their applications. You will see how an energy storage technology's attributes affect the total system's performance and value and be equipped to evaluate the true costs of energy storage, with respect to up-front capital costs, ongoing operating costs, and total carbon footprint. You will also find helpful lessons learned from industry experts as they strove to pave new roads in the development of energy storage technologies and their markets. This is an excellent resource for project developers and anyone who needs a broad understanding of what matters in energy storage.