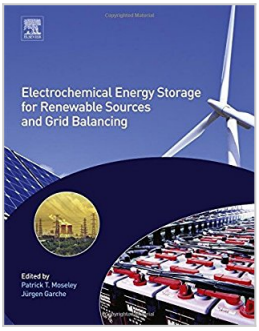

Electrochemical Energy Storage for Renewable Sources and Grid Balancing

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Electrochemical Energy Storage for Renewable Sources and Grid Balancing
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Electricity from renewable sources of energy is plagued by fluctuations (due to variations in wind strength or the intensity of insolation) resulting in a lack of stability if the energy supplied from such sources is used in ‘real time’. An important solution to this problem is to store the energy electrochemically (in a secondary battery or in hydrogen and its derivatives) and to make use of it in a controlled fashion at some time after it has been initially gathered and stored. Electrochemical battery storage systems are the major technologies for decentralized storage systems and hydrogen is the only solution for long-term storage systems to provide energy during extended periods of low wind speeds or solar insolation. Future electricity grid design has to include storage systems as a major component for grid stability and for security of supply. The technology of systems designed to achieve this regulation of the supply of renewable energy, and a survey of the markets that they will serve, is the subject of this book. It includes economic aspects to guide the development of technology in the right direction.

- Provides state-of-the-art information on all of the storage systems together with an assessment of competing technologies
- Features detailed technical, economic and environmental impact information of different storage systems
- Contains information about the challenges that must be faced for batteries and hydrogen-storage to be used in conjunction with a fluctuating (renewable energy) power supply

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Editorial Review

About the Author
Pat was awarded a Ph. D. for crystal structure analysis in 1968 by the University of Durham, U.K., and a D. Sc. for research publications in materials science, by the same university, in 1994. He worked for 23 years at the Harwell Laboratory of the U.K. Atomic Energy Authority where he brought a background of crystal structure and materials chemistry to the study of lead-acid and other varieties of battery, thus supplementing the traditional electrochemical emphasis of the subject.

From1995 he was Manager of Electrochemistry at the International Lead Zinc Research Organization in North Carolina and Program Manager of the Advanced Lead-Acid Battery Consortium. In 2005 he also became President of the Consortium.

Dr. Moseley was one of the editors of the Journal of Power Sources for 25 years from 1989 to 2014. In 2008 he was awarded the Gaston Planté medal by the Bulgarian Academy of Sciences.

Prof. Dr. Jürgen Garche has more than 40 years of experience in battery and fuel cell research & development. In his academic career the focus was on material research. Thereafter, he worked on and directed cell and system development of conventional (LAB, NiCd, NiMH) and advanced (Li-Ion, NaNiCl2, Redox-Flow) batteries. His experience includes also fuel cells (mainly low temperature FCs) and supercaps. He established the battery & FC division of the ZSW in Ulm (Germany), an industry related R&D institute with about 100 scientists and technicians. His interest in battery safety goes back to the work with the very large battery safety testing center of the ZSW. In 2004 he founded the FC&Battery consulting office FCBAT; furthermore he is a senior professor at Ulm University.

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