
Preface

Electricity supply is an important economic factor, particularly in industrialised societies. With restrictions in environmental effects, particularly with respect to greenhouse gas emissions, and in resources, technological innovations are called for which can contribute to producing electricity in a more environmentally friendly way than existing systems and at the same time providing sufficient supply security and economic efficiency.

The question of challenges for innovation in the energy area was already generally discussed in Volume 18 of this book series which was also published in English translation as: “Sustainable Development and Innovation in the Energy Sector”, Springer Verlag. Based on the findings from the generic analysis in the above-mentioned study, but more focussed on specific technologies, Volume 32 concentrated on the interdisciplinary analysis of the regulation of electrical networks (“Die Regulierung elektrischer Netze. Offene Fragen und Lösungsansätze”), while Volume 36 worked on interdisciplinary perspectives of small fuel cell devices for house energy supply (“Brennstoffzellen und Virtuelle Kraftwerke. Energie-, umwelt- und technologiepolitische Aspekte einer effizienten Hausenergieversorgung”). The current study deals with an again more general problem with specific technological aspects: obtaining low-carbon strategies for balancing weather-caused fluctuations and potential gaps in supply prospectively occurring in systems with high shares of electricity production from renewable sources, particularly if wind and solar radiation are predominantly used. This purpose gains importance in view of the attempts in politics to reduce greenhouse gas emissions and, thus, such large shares of wind and solar power are envisaged for future energy systems in several countries, and particularly in the European Union.

The study presents the results of the interdisciplinary work in the project “Energy Storages and Virtual Power Plants for the Integration of Renewable Energies into the Power Supply. Potentials, Innovation Barriers and Implementation Strategies”, which was carried out by the Europäische Akademie GmbH and was funded by the German Aerospace Center (DLR). The necessary disciplinary broadness could be assured by using the instrument of ‘interdisciplinary project groups’ followed at the Europäische Akademie.

My personal thanks go to the members of the project group who coped with the task of the study, partly with strong personal engagement.

Additionally, I would like to thank the German Aerospace Center (DLR) for the financial support of the project.

The results should provide a scientific foundation for the political discussion about the integration of technologies using renewable energy sources for electricity production and hint at tangible innovation barriers. Furthermore, the study shows ways of adequately implementing strategies for low-carbon options that will be necessary with the high penetration of these technologies in future electricity systems. I hope that this book will get the attention in science, politics and the interested public it deserves.

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Balancing Renewable Electricity
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Network Extension from an Interdisciplinary Perspective
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