

Preface

The change in the supply structure for energy is mainly driven by the imminent climate change. Other incentives may be strategic considerations, or generally a paradigm shift in the way our industrial system, and the necessary power supply is operated. The energy supply of the future will implement renewable sources at least to a greater extent as today. Beyond any controversy, increasing portions of renewable energy, particularly wind and solar power, already cause local discrepancies between supply and demand in the power grid.

There are several possibilities to approach the challenges of a changing energy system. For the time being, the extension of the power grid, load management and energy storage facilities are possible measures to meet the requirements of renewable energies. Depending on the future rate of renewable energies, most or even all of these measures have to be implemented. In terms of storage systems, also seasonal storage possibilities are needed. One promising option for long-term storage is the conversion of renewable electricity to chemical energy carriers, like hydrogen, methane, methanol, formic acid, fuels or the hydrogenation of aromatic hydrocarbons.

The intention of this book is to give a brief, but comprehensive overview of the Power-to-Gas technology, one of the chemical storage options for renewable energies. Many researcher groups are currently working on different aspects of this concept. Power-to-Gas plants in a demonstration scale were recently started or are under construction. Therefore, it is not possible to give a concluding résumé of this technology at present. Furthermore, the Power-to-Gas concept is a flexible technology providing a multitude of possible applications. In order to cope with this situation, we tried to describe the current state of the art, actual research and development activities as well as future challenges, without making a claim to be complete. The second part of this book deals with business models focusing on the economic dimension of the Power-to-Gas technology respectively of the Power-to-Gas system, which requires not only business analysis but also comprehensive macroeconomic and systemic analysis.

Currently, the Power-to-Gas technology is economically not feasible. Both, still technological and systemic developments are required. But, in the opinion of the

authors, the long-term storage of renewable energies will be a crucial backbone of the future energy system. If we do not develop technologies today, we will not be able to meet the requirements of tomorrow.

The authors would like to thank Dipl.-Ing. Aaron Felder, Dipl.-Ing. Phillip Biegger, Prof. Dr. Josef Draxler, Lukas Rebhandl, and Fabian Frank for reviewing parts of the manuscript, and Mark Read as well as Jed Cohen, M.S. for transforming and partly translating the text to a readable English.

Leoben, May 2014
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Power-to-Gas: Technology and Business Models

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2014, VIII, 93 p. 20 illus., 12 illus. in color., Softcover

ISBN: 978-3-319-03994-7