

# Energy Technologies and Economics

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# Preface

With a global population heading towards 10 billion, ensuring that there is sufficient energy for everyone is likely the greatest challenge humanity faces today. In fact, it is more pressing than other global problems since energy supply, in particular from sustainable resources, is a prerequisite to solving all other major problems. Consider for example the problems of providing food and clean water: Both food and drinking water can be produced in sufficient quantities if enough energy is available for this purpose.

The problem of sustainable global energy supply is an urgent one, for at least three reasons:

- i. The growth in population and the increase in the standard of living in developing countries alone call for an increased energy supply.
- ii. The depletion of fossil fuel resources (and potentially a crisis when the global demand for oil cannot be met by oil producing countries) will occur in the foreseeable future.
- iii. Increased global warming, which is predicted to reduce the planet's ability to host the growing number of inhabitants, is a distinct possibility.

This book is based on several courses on energy-related topics held by the authors at the University of Bergen and at the Norwegian School of Economics (NHH). In particular, the recent master-level course at the NHH, "Alternative Energy Sources in Physical, Environmental and Economical Perspectives," has motivated the authors to create a text that covers the physical principles behind the most common energy sources on the planet, in combination with estimates on how large the various exploitable resources are. These aspects are combined with an original economic analysis on how much the utilization of resources actually costs us today, and how much it could in the future.

This mixture of the physics, technology and economy involved in human energy consumption—the first and only book of its kind—has since evolved into the basis of a popular course in the international MSc program on energy for Economics students. Though primarily intended as a textbook for first-year courses on energy and society, it is also relevant for all interested readers, providing as it does a collection of concrete facts useful in evaluating the often politically biased statements on human energy production and climate. The text is presented at the simplest possible mathematical level, making it also accessible to readers with no

background in physics, engineering or economics. At the same time, essential physical concepts are introduced wherever necessary, ensuring that the estimates and predictions are quantitative. For each current and potential future energy source, we examine its physical origin, production technologies, resource considerations, price and environmental pros and cons.

In making this book we have benefited from the knowledge and discussions with numerous colleagues at The University of Bergen and at the Norwegian School of Economics. Also, we are grateful for the professional support from the Springer staff in transforming our initial lecture notes into a complete book.

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