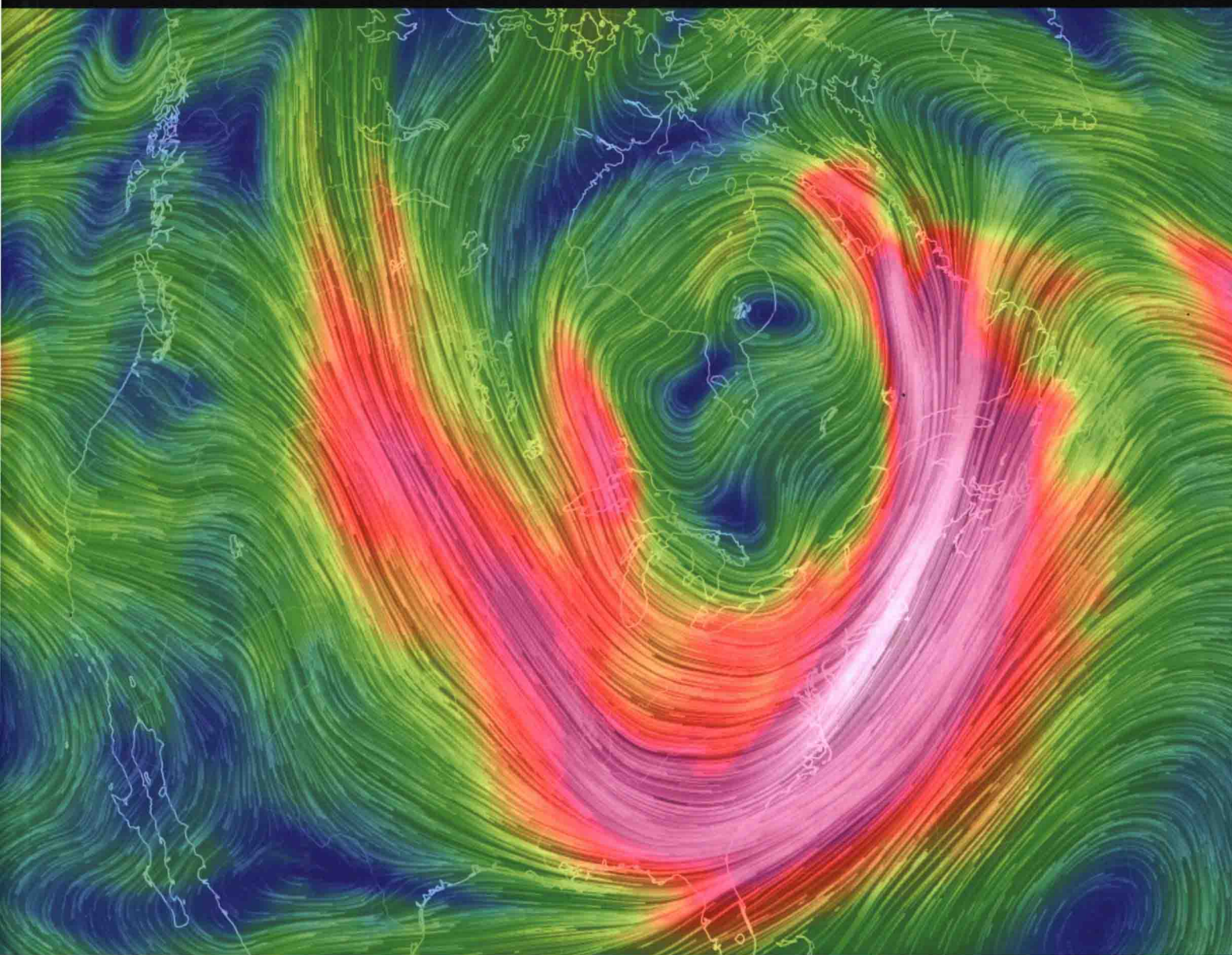


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Renewable Energy

POWER FOR A SUSTAINABLE FUTURE
FOURTH EDITION

Edited by Stephen Peake

Renewable Energy is the ideal introduction to the subject, whatever your degree.

An interdisciplinary approach brings together economic, social, environmental, and policy issues to give you a holistic view of this multi-faceted subject area. Chapters explore the full range of renewable energy technologies, including: solar thermal; solar photovoltaics; bioenergy (in all its forms); hydroelectricity; tidal power; wind energy; wave energy; and deep geothermal energy.

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- An updated chapter explores the status of challenges and opportunities for the integration of renewable energy technologies in rapidly evolving electric grid systems
- A new chapter on renewable energy futures looks ahead to potential developments in this ever-advancing field
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'Excellent material to get undergraduate students engaged with the field before digging into the detail.' Tom Norton, Senior Lecturer, Harper Adams University, UK

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- Curated links to online sources of further information.

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- Figures from the book: to download for use in lectures.

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Renewable Energy

Preface

The transition away from fossil fuels and towards renewable energy technologies is now fully underway. This fourth edition of *Renewable Energy* reflects the remarkable progress that has been made in the field since the publication of the first edition in 1996.

The recent rapid global growth in renewable energy production is no accident. It is the result of three decades of policy-driven research, development, investment, and policy support for multiple renewable energy technologies. It has resulted in crashing prices for large-scale wind and solar PV. So much so in fact, that in this next period, renewable energy will continue to grow robustly and become *the dominant* source of our global energy supply.

A great many challenges still need to be overcome. Helping greater numbers of people access more sustainable supplies of energy is now seen as a critical part of solving some of the world's key global health, climate change and energy security issues. Globally, around 1 billion people still do not have access to reliable, affordable mains electricity. An astonishing 3 billion people (over 40% of the world's population or more than the size of China and India combined) do not have access to modern cooking fuel. Air pollution is a serious and growing problem around the world and remains one of the key drivers of policies to reduce coal consumption in China. Growing populations and incomes will continue to put more pressure on our evolving energy systems.

The renewable energy sources described in this book are essentially carbon-free or low-carbon and appear to be generally more sustainable than fossil or nuclear fuels. However, many technologies are still under development and, at the time of writing, the costs of some remain high.

What happens next in our energy systems is a balancing act performed at two main levels. Firstly, there is the overall balance of investment (and market sentiment) between fossil fuel systems and renewables and other alternatives. Secondly, markets must then decide where and how within the 'alternatives to fossil fuels' market, renewable energy investments should be directed.

If the potential of renewables is to be realized, the world will need many more professional people with a thorough knowledge of renewable energy systems, their underlying physical and technological principles, their economics, their environmental impact and how they can be integrated into the world's energy systems. *This book* is intended to provide a foundation for this knowledge.

Renewable Energy is aimed at students and staff in universities, and at professionals, policymakers and members of the public interested in creating a sustainable energy future.

We hope that *Renewable Energy* will contribute to an improved understanding of renewable energy as a key potential solution to the sustainability problems of our present energy systems. We also hope that it conveys something of the enthusiasm we feel for this complex, fascinating and increasingly important subject.

Stephen Peake

Senior Lecturer in Environmental Technologies, The Open University

New to this edition

- New editor Stephen Peake, Fellow of the Judge Business School and Senior Lecturer at The Open University, brings a fresh perspective to the current state of renewable energy
- A new chapter on 'Thermodynamics' explores the physical basis of energy
- A new chapter on 'Renewable energy futures' looks ahead to potential developments in the field
- An updated chapter on the status, challenges and opportunities for the integration of renewable energy technologies in rapidly evolving electric grid systems
- Enhanced pedagogy includes expanded chapter summaries.

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