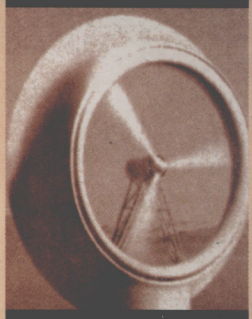
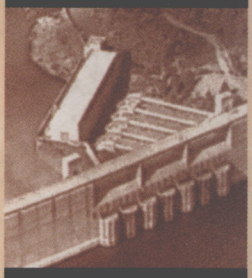
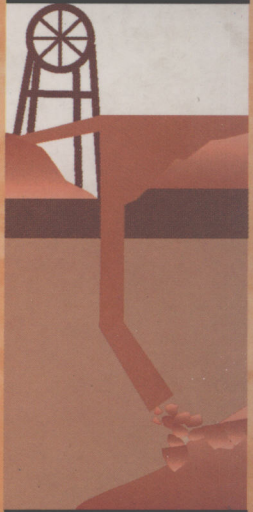
Energy Studies

Second Edition

W. Shepherd
D. W. Shepherd







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Energy Studies

Second Edition

PREFACE

The industrially developed countries of the world have become rich and prosperous by the profligate use of fossil fuels: coal, oil and natural gas. Countries of the developing areas of the world, mainly in the Pacific Rim and Far Fast, are starting to use fossil fuels, especially oil, at increasing rates. But both oil and natural gas reserves are fast depleting and are non-renewable. Each source has only a few tens of years of stock remaining. How is future world energy demand to be met?

To address such a fundamental problem, it is vitally important that all of the various elements comprising the problem are well understood. In the case of world energy, the problem elements are the individual energy sources, both old and new.

At least ten distinct types of energy source exist:

coal
oil
natural gas
nuclear
geothermal
biological/chemical
hydroelectric
wind
wave/tidal
solar energy

Each of these sources is examined in *Energy Studies*, in an attempt to take stock of the development of each, towards either depletion or viable widespread utilisation. Environmental implications, economic assessments and industrial risks are also considered.

By doing this, the authors are able to conclude with an illustrative example of an energy strategy with which to address the world energy future, so encouraging readers to weigh for themselves the complex problem which now stares mankind in the face.

Chapter 1 is written mainly for students of the physical sciences and engineering. More general readers are advised to begin reading from Chapter 2.

W. Shepherd and D. W. Shepherd
July 1997

PREFACE TO THE SECOND EDITION

In the five years that have elapsed since the original publication, the issues of energy matters and environmental concerns have become prominent. Energy supply and use is now a matter of frequent reports, not only in trade journals but in the popular press.

Up-to-date figures are now given for items of fuel supply and also for the use of renewable sources such as wind energy and photovoltaics. The chapters on geothermal energy and nuclear energy have been extended. Increased coverage is given to waste and waste disposal, in Chapter 13.

The energy strategy proposed in the first edition is unchanged. It is the view of the authors that this remains the logical, sensible and workable way to proceed.

W. Shepherd and D. W. Shepherd
June 2002

ACKNOWLEDGEMENTS

Much of the material in this book has been taught in undergraduate and post-graduate courses at the University of Bradford, England, and Ohio University, Athens, Ohio, USA. The authors are grateful to both universities for permission to reproduce teaching and examination materials.

The information was obtained from a vast number of sources, some original. Wherever possible the authors have attributed their sources. Thanks are due to the publishers of pre-existing material for their generous permission to reproduce previously published information. The authors apologise if any pre-existing material is not adequately attributed — this is not an attempt to deceive but due to inadvertence.

Dr James Brooks of Glasgow, Scotland, a distinguished geochemist, read the manuscript. His many helpful criticisms and suggestions have enhanced the presentation, especially the chapters on fossil fuels and on geothermal energy.

The authors' work was greatly helped by the superb facilities of the Alden Library at Ohio University. Special thanks are due to Lars Lutton, photographer, Samuel Girton and Scott Wagner, graphic artists, and especially to Peggy Sattler, graphic design manager in the Instructional Media and Technology Services Unit.

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The typing of the manuscript, with its many revisions during the evolution, was largely done by Suzanne Vazzano of Athens, Ohio. Her professionalism and good nature were indispensable in its completion.

Athens, Ohio, USA
1997

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The authors would like to thank the publishers of the many new sources that are included in this second edition, in addition to re-acknowledgement of the original sources.

Once more the chief sources of information are British Petroleum plc of London, England, and the US Energy Information Administration of Washington, DC, USA.

Dr James Brooks of Glasgow, Scotland, has once again reviewed the chapters on the fossil fuels plus the work on geothermal energy. His careful scrutiny and helpful suggestions are much appreciated. Ms Ann Mandi of Brown University, USA, also reviewed the manuscript and made many helpful suggestions.

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Athens, Ohio, USA
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