

Contents

| | |
|-----------------------------------|-----|
| List of figures | xv |
| List of tables | xix |
| List of abbreviations | xxi |
| I · ENERGY TODAY | |
| Prologue | 3 |
| 1. The Global Picture | 4 |
| The problem | |
| Numbers of things | |
| World energy consumption | |
| Per caput energy consumption | |
| Energy equivalents | |
| On facts and figures | |
| Units and conversions | |
| 2. Primary Energy | 18 |
| Introduction | |
| The world | |
| Interpretation of data | |
| Britain | |
| Switzerland | |
| The United States of America | |
| India | |
| Comparisons | |
| 3. Patterns of Consumption | 31 |
| Energy balances | |
| World uses of energy | |
| Uses of coal – a detailed example | |
| Four countries | |
| People travelling | |
| People at home | |

II · TECHNOLOGIES

| | |
|---|-----|
| 4. Energy Conversion | 63 |
| Introduction | |
| Energy systems | |
| A matter of convenience | |
| Inevitable heat | |
| Refrigerators, heat pumps and a very important rule | |
| Heat engines – and another rule | |
| Footnote | |
| 5. Electrical Energy | 78 |
| Electricity: a new force | |
| Amps | |
| Volts | |
| Watts | |
| Transmission and distribution | |
| Generators | |
| Turbines | |
| A 660-MW power-station | |
| 6. Oil and Natural Gas | 98 |
| Noble fuels | |
| Hydrocarbons | |
| Combustion | |
| A short drive in the country | |
| The internal combustion engine | |
| 7. Coal | 113 |
| An ignoble fuel | |
| Mining | |
| A nice coal fire | |
| Flue gases | |
| Burning clean | |
| Synfuels | |
| Means and ends | |
| Processes and products | |

| | |
|--|-----|
| 8. Nuclear Power | 143 |
| Introduction | |
| Nuclei | |
| Fission | |
| A significant side-effect | |
| Radioactivity and radioactive substances | |
| Reactors | |
| Four types of thermal reactor | |
| Breeders | |
| Footnote on fusion | |
| 9. Energy from Water | 177 |
| Time is of the essence | |
| Highlands, lowlands, rivers and lakes | |
| Alternating currents from alternating currents | |
| Wave power | |
| OTEC | |
| 10. Solar Energy | 197 |
| A very large source indeed | |
| Electromagnetic radiation | |
| Hot water | |
| Solar power | |
| Photovoltaics | |
| 11. Wind Power | 220 |
| The winds that blow | |
| Wind turbines | |
| Wind generators | |
| Environmental effects | |
| Realities | |
| III · THE FUTURE | |
| 12. Penalties | 241 |
| Introduction | |
| ... and statistics | |
| Air pollution | |
| Biological effects of radioactivity | |

xiv *Contents*

| | |
|-------------------------------------|-----|
| The carbon dioxide problem | |
| Probabilities and consequences | |
| 13. Prediction | 265 |
| Exponential growth | |
| Predicting power | |
| Energy and economics | |
| Reserves and resources | |
| Future supplies | |
| 14. Conservation | 290 |
| Apology for this chapter | |
| Bad habits | |
| Insulation | |
| Waste heat | |
| CHP | |
| 15. Alternative Futures | 301 |
| Introduction | |
| Scenarios | |
| USA, 2010 | |
| Britain, 2000 | |
| The world, 2000 and 2030 | |
| Radical alternatives | |
| The all-electric economy | |
| The hydrogen economy | |
| A conservation scenario | |
| Biogas: an appropriate technology | |
| Small is beautiful | |
| 16. Future Alternatives | 324 |
| Choices | |
| Resources | |
| Conservation, prices and prediction | |
| Technology | |
| Appendix A Orders of magnitude | 329 |
| Appendix B Units and conversions | 331 |
| Further reading | 333 |
| Index | 339 |