

Contents

<i>Author Bios</i>	page ix
<i>Acronyms</i>	xiii
<i>Acknowledgements</i>	xv

PART I. INTRODUCTION

1. Energy Technology Innovation	3
<i>Charlie Wilson and Arnulf Grubler</i>	
2. The Energy Technology Innovation System	11
<i>Charlie Wilson and Arnulf Grubler</i>	
3. Historical Case Studies of Energy Technology Innovation	30
<i>Arnulf Grubler and Charlie Wilson</i>	

PART II. PATTERNS AND LINKAGES IN THE ENERGY TECHNOLOGY INNOVATION SYSTEM

4. Grand Designs: Historical Patterns and Future Scenarios of Energy Technological Change	39
<i>Arnulf Grubler</i>	
5. Historical Diffusion and Growth of Energy Technologies	54
<i>Charlie Wilson</i>	
6. Input, Output, and Outcome Metrics for Assessing Energy Technology Innovation	75
<i>Charlie Wilson</i>	
7. Technology Portfolios: Modelling Technological Uncertainty and Innovation Risks	89
<i>Arnulf Grubler, Sabine Fuss, with contributions from David McCollum, Volker Krey, and Keywan Riahi</i>	

PART III. KNOWLEDGE IN THE ENERGY TECHNOLOGY INNOVATION SYSTEM	
8. Solar Water Heater Innovation in the United States, China, and Europe	105
<i>Gregory F. Nemet</i>	
9. Heat Pumps: A Comparative Assessment of Innovation and Diffusion Policies in Sweden and Switzerland	118
<i>Bernadett Kiss, Lena Neij, and Martin Jakob</i>	
10. Sources and Consequences of Knowledge Depreciation	133
<i>Arnulf Grubler and Gregory F. Nemet</i>	
11. The French Pressurised Water Reactor Programme	146
<i>Arnulf Grubler</i>	
PART IV. ADOPTION AND USE IN THE ENERGY TECHNOLOGY INNOVATION SYSTEM	
12. Technological Improvements in Solar Thermal Electricity in the United States and the Role of Public Policy	165
<i>Gregory F. Nemet</i>	
13. Automobile Fuel Efficiency Standards	178
<i>Gregory F. Nemet</i>	
14. Hybrid Cars: Development and Deployment in Japan, the United States, and China	193
<i>Kelly Sims Gallagher</i>	
15. Solar Photovoltaics: Multiple Drivers of Technological Improvement	206
<i>Gregory F. Nemet</i>	
PART V. ACTORS AND INSTITUTIONS IN THE ENERGY TECHNOLOGY SYSTEM	
16. A Comparative Assessment of Wind Turbine Innovation and Diffusion Policies	221
<i>Lena Neij and Per Dannemand Andersen</i>	
17. The Role of Standards: The Japanese Top Runner Programme for End-Use Efficiency	231
<i>Osamu Kimura</i>	
18. Solar Innovation and Market Feedback: Solar Photovoltaics in Rural Kenya	244
<i>Daniel M. Kammen and Arne Jacobson</i>	

19. **The U.S. Synthetic Fuels Corporation: Policy Consistency, Flexibility, and the Long-Term Consequences of Perceived Failures** 257
Laura Díaz Anadón and Gregory F. Nemet

PART VI. RESOURCES IN THE ENERGY TECHNOLOGY INNOVATION SYSTEM

20. **Brazilian Ethanol: Unpacking a Success Story of Energy Technology Innovation** 275
Dustin Meyer, Lynn Mytelka, Rich Press, Evandro Luíz Dall'Oglio, Paulo Teixeira de Sousa Jr., and Arnulf Grubler
21. **Global R&D, Market Formation, and Diffusion Investments in Energy Technology Innovation.** 292
Arnulf Grubler, Laura Díaz Anadón, Kelly Sims Gallagher, Ruud Kempener, Anastasia O'Rourke, and Charlie Wilson
22. **Energy RD&D Investments in the Major Emerging Economies and the United States** 309
Ruud Kempener, Laura Díaz Anadón, Kelly Sims Gallagher, and Kejun Jiang
23. **A Comparative Analysis of Annual Market Investments in Energy Supply and End-Use Technologies** 332
Charlie Wilson and Arnulf Grubler

PART VII. CONCLUSIONS

24. **Lessons Learnt from the Energy Technology Innovation System** 349
Charlie Wilson and Arnulf Grubler
25. **Policies for Energy Technology Innovation.** 371
Arnulf Grubler and Charlie Wilson