

# Contents

Introduction	1
Energy Technology and Economic Development—An Overview	3
Conclusions and Proposals	11
Nontechnical Section	
PART I DIRECT USES OF SOLAR ENERGY	21
Heating, Cooling, Distillation, Crop Drying, and Power Generation	23
Photovoltaic Devices	27
PART II INDIRECT USES OF SOLAR ENERGY	31
Wind Energy	33
Hydropower	37
Photosynthesis as an Energy Source	41
Microbiological Conversion of Plant Materials to Liquid Fuels	44

**PART III OTHER TECHNOLOGIES 47**

Geothermal Energy 49

Energy Storage 53

**TECHNICAL SECTION**

**PART I DIRECT USES OF SOLAR ENERGY 59**

Heating, Cooling, Distillation, Crop Drying, and Power Generation 61

Photovoltaic Devices 87

**PART II INDIRECT USES OF SOLAR ENERGY 111**

Wind Energy 113

Hydropower 137

Photosynthesis 165

Microbiological Conversion of Plant Materials to Liquid Fuels 180

**PART III OTHER TECHNOLOGIES 191**

Geothermal Energy 193

Energy Storage 202

**APPENDIXES**

1. Energy Research and Development with Potential for Small-Scale Application 211

2. Manufacturers of Solar Heating and Cooling Devices 234

3. Manufacturers of Terrestrial Solar Photovoltaic Devices 242

4. External Combustion Engines—Rankine and Stirling Engines as Small-Scale Power Sources for Developing Countries	246
5. Currently Manufactured Windmill Pumps and Generators	270
6. Commercial Developers of Wind Machines	278
7. Windmill Towers for Construction on the Farm	280
8. Currently Manufactured Small-Scale Hydropower Machinery	288
9. The Helical Rotary Screw Expander and Its Potential for Geothermal Application	299