





Revised International Edition

# RENEWABLE ENERGY ENGINEERING AND TECHNOLOGY

## PRINCIPLES AND PRACTICE

Edited by
V V N Kishore

teri

# Foreword

As humanity progresses in the 21st century, it would in future encounter major challenges in terms of ensuring adequate and equitable provision of energy. While the 20th century was characterized by growing dependence on fossil fuels, the current century would have to deal with the depletion of reserves of fossil fuels, growing environmental problems as a result of production and use of these fuels as well as the threat of climate change, which results from the emissions of GHGs (greenhouse gases) due to the combustion of fossil fuels. There are, therefore, several reasons for the world to explore with some urgency alternative sources of energy supply. The IPCC (Intergovernmental Panel on Climate Change) has clearly established that warming of the earth is unequivocal and that while adaptation measures in the short run would require to be implemented with a sense of urgency, mitigation measures to reduce the emissions of GHGs are crucial and essential.

This poses a major challenge for those dealing with energy decisions, particularly in the context of bringing about a major transition to renewable sources of energy. In 1998, I was the president of the International Association for Energy Economics, a body then consisting of about 3000 professionals including academics and senior leaders from the energy supply industry as well as other sectors. In my presidential address, on the occasion of the annual international conference of this body, I made the following statement: 'one area where our profession needs to make a much stronger entry than it has thus far achieved is in the field of energy–environment interface issues. Not only are the direct environmental effects of energy, such as air and water pollution and acid rain, serious enough to merit attention, but there is also now a definite basis for concern over the effects of energy use and production on the global climate. We can postpone a deeper interest in the subject only at the risk of a continuing insularity and myopia. Climate changes are already resulting in serious problems in the tropics in the form of frequent droughts and floods.'

Recent statements by several world leaders express the need to bring about deep cuts in the emission of GHGs, particularly carbon dioxide. This would be possible only with a major shift towards renewable energy technologies. The IPCC's *Fourth Assessment Report* has assessed several scenarios. In one of the scenarios, concentration of GHGs can be stabilized to limit temperature increase at an equilibrium of 2.0–2.4 °C. In order to reach this level of stabilization, a reduction of 50%–85% in the current level of emissions would be required by 2050. Needless to say, such a shift towards a low-carbon economy can only be achieved through a major movement towards greater use of renewable energy.

Development of renewable energy systems for various applications, coupled with their implementation, is a challenging task as it involves understanding of a multitude of disciplines. Developing countries including India need diverse renewable energy products and services, which need to be developed locally to make them affordable and sustainable. This book, which covers several aspects of design, sizing, and system integration, attempts to address the basic needs of a renewable energy designer and developer. The emphasis on the basics of engineering design and practical examples will make the task of system designers easy. The book is well timed to fulfil the needs of students as well as practitioners at all levels. It will also help students from diverse backgrounds such as architecture, biochemistry, and physics to understand the required basics of engineering science. I congratulate the editor and authors of *Renewable Energy Engineering and Technology – a knowledge compendium* for publishing such an important and useful piece of work.

R K Pachauri