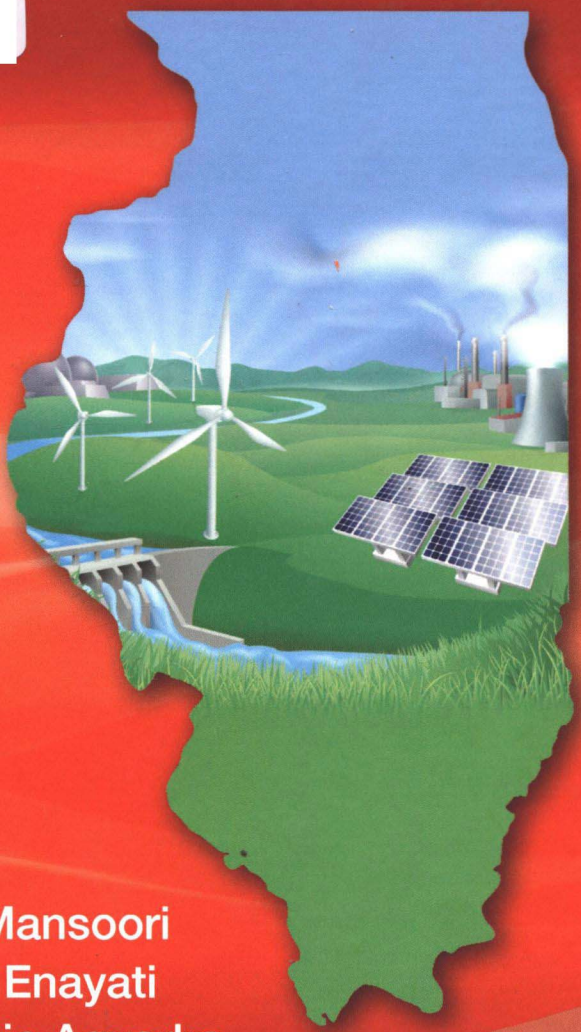
ENERGY

Sources, Utilization, Legislation, Sustainability, Illinois as Model State



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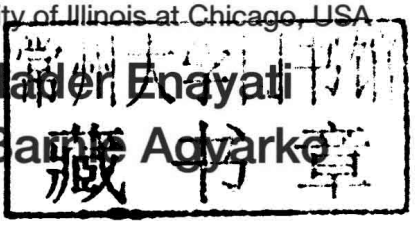

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Preface

The focus of this book is energy sources, utilizations, legislations and sustainability as it relates to a state, a province, a country, or a community within a state. We present various kinds of energy sources, ways to convert energy for end use, better use of energy towards conservation and energy and environmental sustainability. As a very proper model-state we chose the State of Illinois which has the largest overall fossil energy reserves, including the largest strippable bituminous coal reserves; the largest user of nuclear energy in the USA and investing in all kinds of renewable energies including wind energy, solar energy, biofuels, geothermal energy and various energy storage options.

This book consists of 11 chapters and an extensive glossary. Topics of the chapters are:

Chapter 10 Geothermal Energy
Chapter 11 Energy Storage

In writing this book we used our personal funds and our own free time. We neither solicited nor received financial support or incentives from any individual or organization in writing this book. Our motivation to do this project was merely to educate the public (including students, energy engineers and planners, as well as state-wide policy makers) about all aspects of energy and to pay back and serve the State of Illinois, where we have lived most of our adult lives and have enjoyed the opportunities we have been given.

Many colleagues, friends, family members, students and energy experts have encouraged us in various ways to write this book and assisted us in reading the chapters, collaborating with us on related research, or helped us understand a topic from their lectures and writings, which they provided to us. We like to specifically thank the following individuals (in alphabetical order): P. Aich, M. Amin, E. Araújo, P. Araújo, A. Aslan, R. Bagherian, A. Bulvan, F. Civan, G. Crabtree, L.A. Curry, N. DeRose, H. Ebneyoussef, A. Esche, M. Fathizadeh, M. Heidari, H. Kendy, A.F. Koster van Gross, L. Masu, M.M. Moyeri, S. Pandya, A. Saber, V. Sadighian, M. Sarshar, N. Tadayyon, T. Wolf, and F. Zouras. The reader should bear in mind that we have made every effort to find and include proper references to study and report in this book. The authors apologize to those whose publications and energy-related works are not included.

We are grateful to the staff of World Scientific Publishing and specially Ms Chelsea Chin, for their patience and support in the preparation of this book.

About the Authors

G. Ali Mansoori

Dr. Mansoori is a professor of chemical engineering, bioengineering and physics at the University of Illinois at Chicago. He holds degrees of BSc, MSc and PhD and postdoctoral training in chemical engineering. He has been teaching various university level courses on energy and related topics which include (EnrE 100: Energy: Sources, Conversion, Conservation; ChE 201 & EnrE 201: Engineering Thermodynamics; Hon 201: An Introduction to Fossil Fuels; BioE 205: Bioengineering Thermodynamics; EnrE 250: An Introduction to Environmental Pollution Control; ChE 301: Chemical Engineering Thermodynamics; EnrE 495: Energy Conversion; EnrE 501: Advanced Thermodynamics, and other courses in the areas of fluid mechanics, heat transfer, mass transfer, engineering design, irreversible thermodynamics, mixtures, atomic and molecular nanotechnology, nanobiotechnology, phase transitions, statistical mechanics, transport phenomena, and applied mathematics). In addition Dr. Mansoori has delivered numerous short courses on matters related to energy and nanotechnology at the sites of many companies, professional societies, government laboratories and research centers, NGOs, etc.

Professor Mansoori has been active in research in the areas of renewable and non-renewable energies, thermodynamics,

nanotechnology, statistical mechanics and molecular-based study of flow assurance in petroleum and natural gas industries. He has over 550 publications which includes authorship, co-authorship and editorship of ten books, including the present one. He has been a consultant to numerous energy-related companies and organizations.

Dr. Mansoori is the founder of the series of conferences on International Non-Renewable Energy Source Congress (INRESC), co-founder of Fluids and Thermal Energy Conversion (FTEC) Conferences, founder of Annual Midwest Thermodynamics and Statistical Mechanics Symposium Series, organizer of over 185 symposium series, workshops and short courses for various professional societies, industrial organizations and academic institutions on energy and related topics. He has given over 160 invited seminars at various universities and research centers on energy and related topics.

Dr. Mansoori has served as the editor-in-chief of Energy Sources Journal for six years, co-editor of Journal of Petroleum Science and Engineering for eight years, honorary editor-in-chief of International Journal of Nanoscience and Nanotechnology for ten years, as the series editor of books related to energy, and a member of editorial boards of numerous energy and nanotechnology related subjects, the list of which are too many to include here.

Nader Enayati

Dr. Enayati, is a consultant with chemical & energy industries. He holds degrees of BSc, MSc, and PhD in chemical engineering and has worked in energy conversion areas, specifically in the development of first and second generation biofuels through thermochemical and biochemical pathways. Prior to his work as a consultant, he was in charge of biofuels development programs at American Science and Technology, collaborating with University of Wisconsin, Superior; University of Wisconsin, Stevens Point and South Dakota State University. He was one of the organizers of alternative energy technology symposiums at the Chicago State University and University

of Wisconsin, Superior. He has over nine years of experience in process research and development in chemical/biochemical engineering. Nader also served as an editorial assistant of Energy Sources Journal for four years.

Barnie L. Agyarko

L. Barnie Agyarko, is a chemical engineer and an instructor at Kennedy-King College, in Chicago, Illinois. He holds degrees of BSc and MSc, both in chemical engineering. In the past six years, he has been collaborating in engineering research at University of Illinois at Chicago, working on energy related projects. For four years, he worked for Gas Technology Institute in Des Plaines, Illinois, on natural gas processing technologies. Prior to his Master's degree, he spent one year at the Argonne National Laboratory, while developing novel materials for high energy density batteries for specialty and commercial applications. He has publications on both fuels processing and renewable energy utilization.

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