

Energy Conversion, D.Y. Goswami, F. Kreith (Eds.). CRC Press/Taylor & Francis Group, Boca Raton, FL (2007). 900 pp., Price: US\$ 129.95, ISBN: 978-1-4200-4431-7

The flyer accompanying my copy of this book notes that it "...surveys the latest advances in energy conversion from a wide variety of energy sources." I would add to this comment "thoroughly."

The current focus on energy production revolves around global warming caused by increases in CO₂ concentrations in the atmosphere due to the combustion of fossil fuels. The apparent goal of "environmentalists" is to markedly reduce emissions of that gas and as a consequence slow or stop atmospheric temperature increase by reducing use of oil, gas, and coal.

As laudable as that goal is, my personal judgment is that CO₂ emission reduction is not the major problem facing the world. Energy supplies are. My concern is for the finite limit of the current major energy supplies: coal, oil, natural gas and nuclear material. Given that concern, the rationale for focus on renewable energy sources to preserve these nonrenewable materials is the goal.

Thus, this book, with its comprehensive discussion of methods that maximize energy production, is a welcome addition to the literature. The material in this book has been extracted from two previous handbooks edited by these editors. These books are: (1) *Handbook of Mechanical Engineering* and (2) *Handbook of Energy Efficiency and Renewable Energy*.

"This book is divided into two parts: energy resources and energy conversion. The first seven chapters deal with available energy resources including fossil fuels, nuclear, and renewable. Chapters 8–11 cover conventional energy conversion technologies of steam power plants, gas turbines, internal combustion engines, and hydraulic turbines. Advanced conversion technologies such as advanced coal power plants, combined cycle power plants, Stirling engines, and advanced nuclear power are covered in Chapters 12–17. Chapter 15 covers various storage technologies.

Renewable energy technologies including solar thermal power, photovoltaics, wind energy conversion, biomass and biofuels, geothermal energy conversion, as well as waste-to-energy combustion are covered in Chapters 18–24. Chapter 26 presents fundamentals as well as technology assessment of fuel cells. Unconventional energy conversion systems still under development, including nuclear fusion, ocean energy, and direct energy conversion by thermionic, thermoelectric, and magneto-hydrodynamic methods, are covered in Chapters 17, 25, and 27."

The longest of the chapters (134 pp.) discusses the production of solar energy. That chapter is one of three devoted to that topic (see list below).

No energy source is ignored. The authors have included chapters on wind energy (the "hottest" of current renewable energy sources), geothermal energy (rebates currently are being offered

to homeowners who install geothermal systems in Canada), ocean energy (wave generation) and fuel cells.

I was pleased to see a section on anaerobic digester production of methane whose potential, I believe, has yet to be realized with garbage and animal waste as the raw materials. In the same chapter, biofuels (ethanol and biodiesel) are discussed. To illustrate the comprehensive coverage of energy topics in this book, I list the chapter titles below:

- Introduction

Section I: Energy resources

- Fossil fuels
- Biomass energy
- Nuclear resources
- Solar energy resources
- Wind energy resources
- Geothermal energy

Section II: Energy conversion

- Steam power plant
- Gas turbines
- Internal combustion engines
- Hydraulic turbines
- Stirling engines
- Advanced fossil fuel power systems
- Combined-cycle power plants
- Energy storage technologies
- Nuclear power technologies
- Nuclear fusion
- Solar thermal energy conversion
- Concentrating solar thermal power
- Photovoltaics fundamentals, technology and application
- Wind energy conversion
- Biomass conversion processes for energy recovery
- Geothermal power generation
- Waste-to-energy combustion
- Ocean energy technology
- Fuel cells
- Direct energy conversion

My apologies to readers of this review and the editors of this book for my inadequacy in sufficiently describing the material on hand. It is simply too voluminous, comprehensive and topic coverage resplendent with applicable design and engineering data relevant to the topic. The book is a classic and demands purchase by anyone involved in energy production, use or research.

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Why the Wind Blows: A History of Weather and Global Warming, M. Levy (Ed.). Upper Access, Inc., Hinesburg, VT (2007). 192 pp., Price: US\$ 14.95, ISBN: 978-0942679-31-1

This book was written by a civil engineer who was the principal of a consulting engineering firm. It is his fifth book, but the first dealing with the environment which, by the way, is not the topic of discussion until the last chapter. That chapter is preceded by the following chapters that deal mainly with the weather:

- Imported from Siberia – meteorology and the origins of weather
- The currents of Patagonia – Magellan's 38-day adventure
- Force Ten – the sunken treasures of the buccaneers
- Hurricane strength – no region is immune
- Dorothy's whirlwind – great plains tornadoes and cyclones
- The last great adventure – transglobal balloon flight
- Transformations – clouds shed tears
- Conquering the top of the world – snow, blizzards and avalanches
- The unsinkable *Titanic* – ripped open by an iceberg
- Monsoon and other big winds – death and renewal
- The cradle of civilization – floods enrich the Nile valley
- The modern floods – the Missouri and the Mississippi
- El Nino – the mysterious current

For readers of this journal, the most interesting information is in the last chapter entitled: Our changing climate – global warming and our altered future. This chapter calls that topic "...the greatest weather related change in human history" which is an ominous trend that began a little over a century ago and continues today; it is the result of human activity. The change in weather has been gradual, but Levy opines that it could be abrupt in the future. The problem, Levy notes, is that "For the past thousand years, the average temperature in the world has been relatively constant, though it had very slowly crept downward until the end of the 19th century. Since then, there has been a sudden, sharp, and continuing rise in temperature of 0.7 °C."

Global warming results from the emissions of gases that includes carbon dioxide, methane, etc. that are emitted in amounts that overwhelm nature.

Given current trends, the situation will not get better. In the next 50 years, the world's energy use is expected to double led by increased industrial development in China and India. In China, Levy notes, a new coal-fired power plant comes on line every 7–10 days and by 2025 China may exceed the US in carbon dioxide emissions. Not the least of the potential impacts of these emissions is the melting of the glaciers with a concomitant rise in sea level.

Other factors supporting this global warming also are cited. Several key ones are listed below:

- The carbon dioxide in the atmosphere during the last ice age was 180 ppm and, after the glaciers retreated, climbed to 280 ppm. The concentration remained relatively constant after that time but now has reached 380 ppm and is projected to go to 500 ppm before the end of the century.
- The temperature has increased 0.7 °C since the end of the 19th century and is expected to rise 3 °C by the end of this century.
- The habitat of plant and animal species has migrated northward approximately 50 km per decade.
- The Antarctic is losing 150 km³ of ice per year.
- Glaciers throughout the world are retreating.
- Over the last century, seas have risen 150–200 mm.
- The increase in dissolved carbon dioxide in the sea resulted in increased acidity.
- Permafrost is melting in Siberia and Alaska yielding methane and carbon dioxide that had been trapped since the last of the ice age.
- The 10 hottest years in historical record have occurred since 1990.
- The most costly natural disasters have occurred since 1988.

The trends noted above are disturbing and clearly the result of human activity. I recommend that all scientists read this book. It is a sobering look at the impact of society on nature.

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