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0521479851 - Energy Efficiency and Human Activity: Past Trends, Future Prospects

Lee Schipper and Stephen Meyers

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This book presents a detailed analysis of changes in world energy use over the past twenty years. It considers the future prospects of energy demand, and discusses ways of restraining growth in consumption in order to meet environmental and economic development goals. Based on a decade of research by the authors and their colleagues at Lawrence Berkeley Laboratory, it presents a wealth of information on energy use and the forces shaping it in the industrial, developing, and formerly planned economies. The book presents an overview of the potential for improving energy efficiency, and discusses the policies that could help realize the potential. While calling for strong action by governments and the private sector, the authors stress the importance of considering the full range of factors that will shape realization of the energy efficiency potential around the world.

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Sponsored by the Stockholm Environment Institute
Stockholm, Sweden

Lee Schipper and Stephen Meyers
with

Richard B. Howarth and Ruth Steiner
International Energy Studies Group, Lawrence Berkeley Laboratory,
University of California at Berkeley

Prologue by

John Holdren

University of California at Berkeley



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Units of measurement

Energy units

The energy content of various fuels, heat, and electricity is expressed in different units around the world. In the course of our work with numerous sources from many countries, we have converted all units into Joules, the basic unit of the SI system. The units that we commonly use, and their equivalence to other units often found, are as follows:

EJ (exajoules) = 10^{18} Joules = 0.948 quads (10^{15} Btu) = 240×10^6 toe = 239×10^{12} kcal

GJ (gigajoules) = 10^9 Joules = 0.948 million Btu = 0.024 toe = 239×10^3 kcal

MJ (megajoules) = 10^6 Joules = 0.948 thousand Btu = 0.024×10^{-6} toe = 239 kcal

When referring specifically to electricity, we present data in watt-hours (Wh) or watts (W):

kWh (kilowatt-hours) = 10^3 watt-hours = 3.6 MJ

TWh (terawatt-hours) = 10^{12} watt-hours = 3.6 PJ

kW (kilowatts) = 10^3 watts

MW (megawatts) = 10^6 watts

TW (terawatts) = 10^{12} watts

“Commercial energy” refers to all forms of energy other than biomass fuels (fuelwood, agricultural residues, and dung), traditional uses of wind and solar energy (e.g., water pumps and solar drying), and animal and human power. The term “commercial energy” is actually misleading, since much biomass fuel is traded in commercial markets or is used by industries, in many cases substituting for fossil fuels. It is still the most commonly used term for “modern” fuels, however, so we use it despite its flaw.

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“Primary energy” includes losses and own-use in the production of fuels, district heat, and electricity and in the delivery of district heat and electricity. “Final energy” refers to actual consumption by end users. (In some international data compilations, what is reported as final energy often includes losses in district heat delivery.)

Monetary units

When comparing monetary units among countries, we usually make use of Purchasing Power Parities (PPP) rather than currency exchange rates to convert local currencies to a common unit. Use of purchasing power parity is designed to equalize purchasing powers of currencies in the respective countries. It is defined as the number of units of a country’s currency required to buy the same amounts of goods and services in the domestic market as one dollar would buy in the United States. Thus, the unit in which GDP or energy prices is expressed is not a dollar per se, but rather a dollar-equivalent.

Other units

Measures of weight are given in metric tons (tonnes); one tonne = 1000 kilograms (kg). Measures of volume are given in liters (l) or US gallons; one gallon = 3.785 liters. One US gallon = 0.833 Imperial gallons.

Measures of distance are usually given in kilometers (km); one kilometer = 0.62 miles.

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Commonly used acronyms

bn	billions
CAFE	Corporate Average Fuel Economy
CCE	cost of conserved energy
CFCs	chlorofluorocarbons
CFLs	compact fluorescent lamps
DEM	Deutsches Mark
DSM	demand-side management
EPA	Environmental Protection Agency (US)
GDP	Gross Domestic Product
HVAC	Heating, ventilating, and air-conditioning
ISIC	International Standard Industrial Classification
kg	kilograms
km	kilometers
LDCs	Developing Countries (Less Developed Countries)
LPG	Liquid Petroleum Gas
mpg	miles per gallon
mt	millions of tonnes
NICs	Newly Industrialized Countries
NMP	Net Material Product
OECD	Organization for Economic Cooperation and Development
p-km	passenger-kilometers
PPP	Purchasing Power Parities
RD&D	Research, Development, and Demonstration
rpm	revolutions per minute
Scandinavia-3	Denmark, Norway, and Sweden
SEK	Swedish Kronor
smg	seat–miles per gallon
t-km	tonne–kilometers
UEC	unit energy consumption
VA	value added