



BOOK REVIEW

Encyclopedia of Energy, (6 volumes, Elsevier, 2004)
Editor-in-Chief, Cutler J. Cleveland (Boston University), 3,600 pages, ISBN: 0-12-176480-X.

This is the Hummer of energy books. The Elsevier *Encyclopedia of Energy* (see Table 1) is almost twice as large as two predecessor energy encyclopedias combined. The price tag is commensurate. This set is only for the wealthy, the addicted, large libraries, and paid-in-kind reviewers.

Table 1. Recent Energy Encyclopedias

	Wiley	Macmillan	Elsevier
Volumes	2	3	6
Pages	1,562	1,270	5,146
Entries	165	253	380
Contributors	190	170	475
List Price	\$295	\$110	\$1,950
Publication	1997	2001	2004

Encyclopedia editor Cutler Cleveland, an ecological economist, introduces the compilation (p. xxxi) as “the first comprehensive, organized body of [energy] knowledge for what is certain to continue as a major area of scientific study in the 21st century.” The nearly 500 authors are advertised as leaders in their respective fields—and from 40 countries. However, the diversity stops where it is most needed. While many entries are exemplary and the scope of the effort laudable, this encyclopedia showcases the alarmist wing of the energy sustainability debate and excludes contrary views.

ALARMISM & MANDATES

The politicization begins right up front. The foreword paints a dire picture of the carbon-based energy economy and opines, “Major changes are required in energy system development worldwide” (xxvii). Business-as-usual is the foe because the “desired energy futures will not happen” given “present policies and conditions in the marketplaces that determine energy generation and use” (xxviii). The solution — “combinations of technologies that meet all sustainable development challenges at the same time” — is advertised as ready to go. Policy reforms include “cost-based prices” that incorporate

“external environmental and health costs and benefits (now sometimes larger than the private costs).” For maximum effect, this opening is reprinted in all six volumes.¹

The encyclopedia’s bias and righteous tone appears in other entries. Eric Heitz of the Energy Foundation states in “Philanthropy and Energy” (5:1), “Smart philanthropy ... can help spur markets for the next generation of clean energy technologies that address the energy/environmental nexus, especially global warming pollution.” In “Nongovernmental Organizations (NGOs) and Energy,” the authors describe the role of Greenpeace, Natural Resources Defense Council, and the thousands of smaller sisters as “design[ing] improved energy policies...to [meet] the needs of citizens and marginalized stakeholders” (4:313).

A number of entries critique conventional energies for imposing negative externalities, including “environmental injustices” (2:503). Others assert the sustainability problem and explore solutions. Amory Lovins’s case for greater energy efficiency in the face of market resistance leads him to call for “systematic ‘barrier busting’ atop the policy agenda” (2:398). Kornelis Blok closes “Lifestyles and Energy” with the “intriguing idea” of allocating carbon permits per individual where points are deducted from each person’s “carbon credit card” (3:662). These non-rebutted entries are hardly “encyclopedic.”

THE MISSING WORLDVIEW

A worldview shunned in the encyclopedia interprets the current economy as sustainable and becoming more so over time. This optimistic view dates at least to the resource studies emanating from *Resources for the Future* in the 1950s and 1960s, particularly *Scarcity and Growth* (1963) by Harold Barnett and Chandler Morse. The statistics of progress were turned into a worldview by the late Julian Simon and popularized most recently by Bjorn Lomborg in *The Skeptical Environmentalist* (2001). A vibrant school of thought, loosely described as *free-market environmentalism*, works within this tradition today. Many economists are sympathetic with this viewpoint.

There is not one entry to inform the reader that such a worldview exists. Bits and pieces of the alternative view are buried in different essays, but none comprises a clear challenge to the alarmism paradigm.

Perhaps the systemic bias should not be surprising. The *Wiley Encyclopedia of Energy and the Environment* does not present the nonalarmist view either. The *Macmillan Encyclopedia of Energy* has balance, although it

1. The encyclopedia’s foreword is more extreme than the entries. For example, it estimates (without attribution) that “permanent subsidies” for conventional energies are \$250 billion (xxviii), while the estimate in the main body, still very high, is \$100-200 billion (5:366).

did not start this way. An editor change mid-stream brought in new authors and subjects to address a bias problem.²

A second overriding problem of the Elsevier encyclopedia is its repetitiveness and thus length. A good deal of overlap between entries could have been avoided by page-specific cross-referencing and grouping entries by topic. Instead, there is an alphabetical free-for-all with the 380 entries in six tomes. Going from one five-pound volume to another to investigate the same topic is not easy. Similar entries could have been merged. A few entries take “comprehensive” to new heights—e.g., “Marx, Energy, and Social Metabolism” and “Energy Costs of Reproduction.” At least one volume could have been eliminated by regrouping, combining, tightening, and focusing.

THE GOOD

There are many fine entries. A number of the economics and history chapters are penned by names familiar to readers of *The Energy Journal* and do not disappoint. M.A. Adelman and Michael Lynch on petroleum, Arlon Tussing on natural gas, Vaclav Smil on energy history, Richard Gordon on coal, among others, grace the volume. Technical articles on energy fundamentals are excellent encyclopedia fare. Economists, beware of non-economist forays, however. One entry defines economics (1:359) as: “A branch of behavioral biology dealing with the allocation of scarce resources by *Homo sapiens*, one of the many organisms found on Earth.”

Table 2. Subject Areas in Elsevier Encyclopedia of Energy

Basics of Energy	Measurement & Models
Coal	Nuclear Power
Conservation and End Use	Oil & Natural Gas
Economics of Energy	Policy Issues
Electricity	Public Issues
Energy Flows	Renewable & Alternative Sources
Environmental Issues	Risks
Global Issues	Society & Energy
History & Energy	Sustainable Development
Material Use & Reuse	Systems of Energy

Entries on the history of energy are informative. The long history of solar, wind, and fuel cells gives the reader a quite different perspective on what the foreword blithely calls “modern forms of energy” (xxix). The detail and range

2. The contributors invited by the new editor included the present writer (“Green Energy”), Richard Gordon (“Subsidies and Energy Costs”), Kenneth Green (“Air Pollution,” “Climate Effects”), Richard Stroup (“Environmental Economics”), and Ronald Sutherland (“Efficiency of Energy Use”).

of such entries as “Fire: A Sociological and Historical Survey” and “Energy and Culture” make this energy encyclopedia unique.

What little balance there is in the politically charged areas is welcomed. An entry by Adam Jaffe, Richard Newell, and Robert Stavins, “Economics of Energy Efficiency,” somewhat counterbalances four (repetitive) essays on market failure and the “efficiency gap” by Amory Lovins, Marilyn Brown, Arthur Rosenfeld et al., and Richard Howarth. Still, an entry critical of the economics of government energy conservation programs is needed.

“Market failure” has its own entry (3:769-79) and is repetitively discussed elsewhere under the terms “social costs” and “externalities.” (Externalities, by the way, are all negative as if there are no positive externalities from free-market energy abundance.) Yet *government failure* has a long history in energy policy that cautions against jumping from a perceived problem to a government solution, particularly with a monumental undertaking such as national and international carbon rationing.

Rather than have an entry, “Government Failure,” with case studies from the energy sector, occasionally an author will mention in passing potential problems with interventionism. Says one, “There is an ever-present risk of overregulation: ‘state failure’ is the other side of market failure” (3:560). Richard Gordon discusses the government problem in the context of coal regulation as does Adam Jaffe et al. on energy efficiency. Still, the reader will not appreciate the fundamental insights that *public choice economics* brings to the climate change-energy transformation debate.³

Some articles (Gordon’s “Energy Policy in the Coal Industry” and Amy Jaffe’s “Geopolitics of Energy”) frame the policy issues as between what interventionists want and what is realistic. Their approach comes across better than assuming the problem and exhorting transformation as is done by many other authors.

Some entries forthrightly indicate the lack of a clear solution to the posed energy sustainability problem (1:379; 1:409), contradicting another point made in the foreword. Nuclear power is treated extensively (16 entries) without support as a major carbon reduction strategy. In “Nuclear Power Economics,” Geoffrey Rothwell (4:393) estimates the cost of a new 1,400-MW unit at between \$2.5 and \$2.8 billion, making it competitive with power generated from a combined cycle facility fueled by natural gas bought between \$3.30 and \$4.85/MMBtu, depending on capital costs.

The difficulties of the low-carbon solutions discussed in some entries should have inspired an entry on *adaptation* as a climate-change policy. The alarmist camp sees adaptation as defeatist, however, and the encyclopedia keeps the door closed on this approach.

3. For greater detail on these points, see Robert L. Bradley, Jr., *Climate Alarmism Reconsidered* (London: Institute of Economic Affairs, 2003).

THE UNDEVELOPED

The Web sites of the U.S. Energy Information Administration and U.S. Environmental Protection Agency contain time-series data indicating many positive trends relating to energy. Available international statistics show progress in most areas. Yet this encyclopedia is deficient in treatment of these trends. Many entries complain about the *levels* of pollution while ignoring *trends*. Basic data such as criteria pollutant emissions in the United States since 1970 or emission reductions from power plants and vehicles in recent decades are not presented.

The encyclopedia's much-discussed *resource curse*—defined as “the inverse relationship between high levels of natural resource dependence and growth rates” (4:661)—is not analyzed as a problem of socialism versus capitalism. The problem with oil wealth is not oil but government control of oil. (Guillermo Yeatts's proposal to privatize the subsoil in Latin American countries to democratize and create wealth is part of this debate.) Entries that discuss nationalism and geopolitics could also benefit from a property-rights approach.

An entry on the collapse of Easter Island starting in the 16th century also provides some back-door balance. Rather than jumping to Malthusian conclusions, the author mentions that the ruinous depletion (starting with deforestation) that appears to have occurred resulted from a lack of property rights to ration demand to available supply (1:875). The lesson here explains in part why there is such energy wealth in some parts of the world and tragic energy poverty elsewhere.

THE NOT-SO-GOOD

The entries on the history of energy *thought* are distinctly weaker than those on the history of energy. The founder of mineral and energy economics, William Stanley Jevons, does not even make the index, although he is mentioned once in passing (2:129). Jevons's *The Coal Question* (1865) did much more than pose the challenge of mineral extraction contra reproducible goods and services. The book explained why wind, biomass, geothermal, and hydro could not substitute for coal to power industrial society. Jevons also explained how improving energy efficiency increased overall usage over time.⁴ Jevons was the first to frame—and partially answer—the energy sustainability issues still debated today.

An entry on resource depletion by John Hartwick (1:771-779) does not consider whether “Hotelling rent” and other depletionist concepts are *nonoperative*. A better framework, Erich Zimmermann's functional theory of

4. Jevons's oeuvre is presented in Bradley, *Climate Alarmism Reconsidered*, pp. 171-74.

mineral resources, which sees institutional change, not depletion, as shifting scarcity values, is not presented.⁵ The discipline of economic geography, ably summarized by Barry Solomon (2:25-34), also has much to offer in place of a macro depletion approach.

Some entries badly lack balance. Paul Epstein's "Climate Change and Public Health: Emerging Infectious Diseases" is such an example. As Epstein fails to indicate, Paul Reiter of the Centers for Disease Control and Prevention (U.S. Department of Health and Human Services) has vigorously challenged such alarmism.

Advocacy of energy conservation as a substitute for growing production is prevalent in the encyclopedia. An essay on the history of modern energy conservation applauds S. David Freeman's 1974 study for the Ford Foundation, *A Time to Choose*, and states (1:657), "Sadly, there remains a persistent struggle between advocates of energy supply and conservation advocates." Freeman's report had no supply-side strategy, and today environmentalists vigorously oppose resource development to increase energy prices and force conservation. No entry alludes to this strategy or suggests that energy sustainability might be better served by growing energy supply.

The work does not critically discuss questionable new terms and concepts such as emergy, exergy, heterotrophic energy flows, and industrial symbiosis.

An entry (2:437-57) on the history of energy service companies (ESCOs) is silent on the crash-and-burn experiences of mega-ESCOs such as PG&E Energy Services and Enron Energy Services. Conservationists were once ecstatic about energy outsourcing, which promised double-digit savings compared to business-as-usual. This turned out to be an accounting fiction that created profits on paper only. The lesson was that commercial and industrial customers were not as energy inefficient (or uninformed) as engineering studies, and some conservation gurus, suggested.

David Stern's "Environmental Kuznets Curve" claims, contrary to many other studies, that the hypothesized negative correlation between wealth and environmental harms is mostly the result of inadequate statistical methods. "There may be an inverted U-shaped relation between urban ambient concentrations of some pollutants and income" (2:525), but he sees this as tentative at best.⁶

The entries review the climate-science debate as if the science was settled, and the range of findings of climate models could be taken at face value. Major critics such as Richard Lindzen of MIT are ignored.

The incomplete view of climate science leads to a bigger problem—total neglect of the cost-benefit estimates of Yale University's Robert Mendelsohn and other specialists regarding future anthropogenic warming. Their painstaking

5. For an attempted resurrection of Zimmermann's long-forgotten theory, see Robert L. Bradley, Jr., "Are We Running Out of Fossil Fuels?" *PERC Reports*, September 2004, pp. 3-6.

6. See e.g., Bruce Yandle et al., "Environmental Kuznets Curves: A Review of Findings, Methods, and Policy Implications" (2004). Available at <http://perc.org/publications/research/kuznets2.php?s=2>

aggregation looking at water resources, sea level rise, energy costs, commercial fishing, outdoor recreation, timber, and agriculture concluded that benefits slightly exceed costs for the United States by the year 2100. Mendelsohn has estimated global costs and benefits to be about even on net, although there are winners and losers depending on location and economic system.⁷ The CO₂ fertilization effect and relatively benign warming distribution are important in this result.

Surely the reader would want to know about the findings of this relatively new sub-discipline of applied economics.

SUMMARY

Thomas Wälde stated in “International Energy Law and Policy” (3:557):

Sustainable development suffers from an imbalance: rhetoric overwhelms action, affirmation of moral values overwhelms implementation, and good intentions prevail over getting good results. Results can be achieved only if the “game” is properly understood.

This encyclopedia advertises itself as offering the reader the knowledge to understand the energy game. It does not. There is erroneous and incomplete information in many crucial areas. Whole entries are missing that provide the proverbial “rest of the story” (Table 3).

Table 3. New Entries for Encyclopedia Balance

Carbon Regulation, Problems of	Energy Optimism, School of
Climate Change, Adaptation to	Energy Politicization, Consequences of
Climate Change, Benefits of	Energy Sustainability, Improving
Climate Sensitivity, Debate over	Resources, Functional Theory of
CO ₂ Fertilization Effect	Statism and Energy Poverty
Energy Scares, History of	Subsoil Privatization, Opportunities for

The ideal energy encyclopedia should be shorter, cheaper, and better. It should present both sides of the energy sustainability debate and show more skepticism toward pessimism grounded in scientific maybes and economic half-truths.

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7. See the discussion in Bradley, *Climate Alarmism Reconsidered*, pp. 88-90.