# Book Reviews

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# Book Reviews

## Electricity for Rural People

by GERALD FOLEY
London: Panos Publications Ltd., 1991
pp.195, ix

This book is the final report of a program on rural electrification undertaken by The Panos Institute with the support of a number of European donor agencies. (Panos is an NGO that split-off from Earthscan, the press and information arm of the International Institute for Environment and Development.)

This relatively thin book, in a large, easy-to-read format, might easily be ignored by students of energy matters. That would be a mistake. Foley has provided a succinct, yet careful, discussion of the *how* and, more importantly, the *why* of rural electrification.

Foley begins by reviewing experience with rural electrification in the northern hemisphere (mainly the United States and Ireland) and then, for most of the book, focuses on the southern hemisphere. Not surprisingly, he finds that rural electrification has seldom lived up to its promise as an engine of development; indeed, Foley suggests that, where it has been successful, it is more a result than a cause of development. (If anything, Foley is rather too positive about the links between rural electrification and development in the United States.)[1]

In keeping with the essentially instructive purpose of the book, Foley starts with conclusions. Citing a few of them will indicate his commonsense perspective:

- "A reliable supply of electricity is essential to the long-term economic development of rural society" and, "where the necessary conditions are present it has a major impact *on the form that development takes* . . . especially in the service sector." (Emphasis added.)
- "Cheap electricity does little to stimulate irrigated agriculture, grain milling or other rural industrial activities. Access to markets,

1/ The Southern Appalachian region of the United states never achieved true economic development despite widespread rural electrification following the formation of the Tennessee Valley Authority (TVA) in 1933. While electricity undoubtedly improved quality of life for many people, the absence of other necessary conditions and of political power kept the Southern Appalachians in a state of underdevelopment. See Harry M. Caudill, *Night Comes to the Cumberlands* (Boston: Little-Brown, 1965) and Helen M. Lewis and Edward E. Knipe, *The Colonialism Model: The Appalachian Case*, paper presented at the American Anthropological Association, 1970; reprinted in Lewis, Johnson and Askins, editors, *Colonialism in Modern America: The Appalachian Case* (Boone, North Carolina: The Appalachian Consortium Press, 1978).

the price . . . and the availability of other necessary inputs are normally far more important . . . "

- In the early stages of rural electrification, benefits go principally to "the better-off families and commercial and industrial users; poor households are usually the last to be connected."
- Most off-grid electricity will continue to be supplied by means of diesel generators. Under special conditions small-scale hydro and other renewable technologies can compete with diesel, but "They should normally be assessed on the same technical and financial criteria as conventional supply options."
- Much donor assistance "tends to fragment rather than to strengthen local policy making." Donor agencies are invited to "establish common standards for assistance" and to encourage local manufacture of equipment and local institutions for managing and maintaining the system.

Subsequent chapters present the evidence for these conclusions with information on technology, demand for electricity, supply options, and economic evaluation. The book then goes on to more difficult issues by asking when and where different kinds of electrification are appropriate, what non-economic benefits might be attributed to electrification, and what sorts of institutions are needed if rural electrification is to be successful by any standard. The book concludes with seven short national case studies of countries ranging in income from Bangladesh to Ireland, and in size from Fiji to India.

*Electricity for Rural People* is written at a level that almost any reader will find too simple in some places but more engaging in others. Thus, the technical chapters will be trivial for an engineer, yet that same engineer may find the 'why' chapters on development more challenging. The development specialist may have learned not to trust the many myths about rural electrification, but find the technical chapters rewarding. Field workers may already know that a strong desire for electricity exists even among poor families in poor villages[2] (something that Foley may not sufficiently emphasize), but learn why this demand will prove ineffective in the absence of a sound institutional base.

The book is perhaps most directly aimed at staff in NGOs and rural development agencies who — if one may generalize so wildly — are typically looking for intermediate technologies that can increase incomes while promoting equity, and who argue for a greater role for local institutions and greater use of renewable sources of energy. Foley speaks directly to them in pointing to the critical, yet secondary, role of electricity. He recognizes the virtue of local management, but simultaneously urges a liberal regime in which electricity would be sold at real cost, services offered by independent agencies, and private suppliers encouraged to generate and distribute electricity. In the same way, Foley is positive about a role for renewable sources, but cautions that conditions must be right. There is one exception. He offers a negative perspective toward photovoltaic systems, which he argues are not only expensive but, for most applications, too rigid in supply characteristics to be considered true development.

The last few chapters, on institutions for rural electrification, are particularly interesting. One chapter deals with the need for autonomous rural electrification agencies, and organizational approaches such as coops. Another on devolving supply to the local level, which includes options for both private and community-managed schemes. Still another on appropriate tariff schedules. Throughout, Foley's focus is on increasing the pace of rural electrification, but in ways that are supportive of equity and local empowerment. This implies tough choices to provide electricity in some areas and not others. As well, "governments and utilities will have to search for ways to cut costs, improve financial returns, and reform management structures."

The advice proffered in the last sentence could as well have been directed to NGOs and community organizations. Just as whole books have been written on the technology of rural electrification, there is much more to be said about the institutional questions than could be contained in this book. Based on what is presented here,

2/ Christopher Flavin, *Electricity for a Developing World: New Directions*, Worldwatch Paper 70 (Washington, DC: Worldwatch Institute, 1986).

one can hope that Foley and Panos will pick up that challenge.

*David B. Brooks (Associate Director, Economic Policy Program) and Renaud De Plaen (student), International Development Research Centre, Ottawa*

## Recent Modelling Approaches in Applied Energy Economics

by OLAV BJERKHOLT, ÖYSTEIN OLSEN and JON VISLIE (Editors)
London: Chapman and Hall, 1990
268pp., xix

The latest addition to Chapman and Hall's International Studies in Economic Modelling series concentrates on the modelling of applied energy economics. The applications are all specifically related to Norway, but this is no disadvantage since the focus on one limited case gives cohesion to the volume, with little or no loss of interest. Furthermore, many of the issues have very similar counterparts in other industrialized oil producing countries.

Cohesion has also been assured by careful editing and by the fact that the editors have coauthored a majority of the papers. The volume addresses three distinct but related topics: the European gas market, the management of national petroleum resources, and the relation between the world oil market and macroeconomic performance. The unifying theme in all of this, not least from the viewpoint of our Norwegian colleagues, is of course the fact that for almost two decades they have been struggling hard with the problems associated with sensible management of their country's newly-found riches.

This book is a good illustration of both the advancement of Norwegian economics in general and of the results of their long-standing experience with energy issues. Almost all the chapters manage to apply interesting and more-or-less novel methodology to a sensible description of empirical reality.

My own preference goes to the first part of the book on the European gas market, both for its novelty and clarity. The opening chapter for instance is an interesting analysis of the potential consequences of deregulation and competition in this gas market. The authors start with a brief overview of the market and clearly explain the concepts and issues (such as the institution of common carriage in the pipeline industry). They present evidence that gas prices could be brought down considerably by competition and discuss the implications of this for demand. Finally they use an interesting dynamic model of an oligopolistic game to simulate various supply and price scenarios.

Inevitably such markets are hard to predict, but the point of the article is to show that although the number of producers is very limited, oligopolistic competition may (with common carriage) lead to a very fierce fight for market shares, to the obvious benefit of consumers.

The second article in this section casts additional light on the issues involved in using a multinominal logit choice model to analyze residential demand for various heating fuels. Two parts of it focus on the implications of limited competition between buyers and sellers, and another discusses the environmental consequences of a transition to gas. The fact that gas combustion gives smaller emissions of such pollutants as sulphur and carbon dioxides is clearly a benefit when comparing gas to coal and oil. Since some of the emissions from combustion may be "re-exported" to other countries (including Norway from where the gas is bought), these transboundary externalities could conceivably be considered in international price negotiations. This is mentioned though not modelled in the paper.

The second part of the book on management of national petroleum resources also contains quite a broad and interesting selection of papers, starting with the more traditional "optimal depletion" under uncertainty model, and moving to empirical investigations of how large the Norwegian petroleum rent actually is and how it has in fact been spent. There is also an interesting contribution on the issue of the State's risk-neutrality and discount rates. One application looks at the choice of investments in hydro-power and gas-fired power stations when there is uncer-

tainty both with respect to electricity demand and gas prices. In the last paper the author attempts to model optimal depletion in the presence of joint production (oil/gas) with different market structures for each product.

The last part on the world oil market and macroeconomic performance contains only two papers: one on cooperation between Norwegian or other "NOPECS" and OPEC, and one on the actual effect of oil-price shocks on economic growth. Both are quite interesting subjects, but their treatment and the disparity between them make this section seem somewhat of an afterthought. Nevertheless it does round off the volume, and it brings the reader back to some essential macro-issues.

All in all this is a very readable book with some very useful methodology and interesting conclusions.

*Thomas Sterner*
*Department of Economics*
*Gothenburg University*
*Sweden*

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## Synthetic Fuels

by RONALD F. PROBSTEIN and R. EDWIN HICKS
Boston: Massachusetts Institute of Technology, 1990
pp.455

The western world still depends almost exclusively on oil and natural gas as the primary sources of fossil fuel energy. When these commodities are cheap and readily available, synthetic fuels receive relatively little attention. However, because of the inevitable decline in the availability of oil and natural gas, synthetic processes will be of primary importance within the foreseeable future. This book serves as a summary of the continuing developments in synthetic fuels, and as such it represents a valuable contribution to the literature on alternative energy.

*Synthetic Fuels* was assembled from a graduate course at the Massachusetts Institute of Technology and is geared towards the beginning graduate or advanced undergraduate student. A solid understanding of basic engineering thermodynamics is assumed, but the concepts needed to understand the subject matter are carefully introduced and useful summaries of important formulae are given.

The book is divided into 10 chapters covering a wide variety of subjects. The first three chapters briefly introduce the history of synthetic fuels, the chemical and physical concepts needed to understand the processes, and the basic conversion fundamentals underlying the production of synthetic fuels. A descriptive summary of major coal, oil shale and tar sands deposits is given, with a discussion of the different physical forms in which these deposits can be found and their applicability to the production of synthetic fuels. The fundamentals of organic and inorganic chemistry are discussed, along with thermodynamics, reaction kinetics, catalysis, pyrolysis, gasification, synthesis, and liquefaction. In short, anything which will be needed in subsequent chapters is provided.

The heart of the book is formed by chapters 4-7, which are used to discuss the production and upgrading of gaseous and liquid synthetic fuels from coal, oil shale and tar sands. A wide spectrum of the different methods currently in use in all parts of the world are examined. Pictures, flowcharts, tables, and graphs are added liberally to help explain the different processes. The survey of methods presented is thorough and comprehensive, covering not only a large range of production plants, but also the various in-situ methods currently available.

The last three chapters nicely round off the book with a discussion of biomass conversion, environmental issues, and finally, the economic framework of synthetic fuel production. These subjects are of critical importance in light of the ever increasing pollution-control regulations being implemented, the heightened public awareness of the environmental impact that large petrochemical plants can have on ecology and climatology, and the sensitivity of such installations to various economic factors.

Appendices include tables of physical constants, units, and conversion factors, as well as a full symbol and acronym table. SI units are used

throughout, but British units are included in brackets where needed, due to their still-predominant use in the US petroleum industry. The cross-reference index is both extensive and comprehensive. References for further reading are provided at the end of each chapter.

A small complaint can be levelled at the authors for failing to provide exercise problems. This in itself may not diminish its usefulness as a learning text, however, considering the relatively advanced level of student it has been written for.

A great deal of care has been taken in the preparation and presentation of the material, and effort has been made to make sure the contents flow logically from one section to another. This text provides a concentrated overview of the subject. It is recommended for anyone with an engineering or science background who wants either to learn more about this interesting field, or use it as an overview textbook for a course.

*Thomas Beuthe*
*Graduate Student*
*Department of Engineering Physics*
*McMaster University*

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