

## BOOK REVIEWS

*Renewable Energy Strategies for Europe (Vol. II): Electricity Systems and Primary Electricity Sources* by MICHAEL GRUBB WITH ROBERTO VIGOTTI. (London, UK: Royal Institute of International Affairs, 1997), 231 pages. ISBN 1-85383-284-7.

This book is the second volume in a series of books on renewable energy strategies for Europe. Renewable energy modes covered are hydro, wind, SPV, and ocean energy (wave and tide). Surveys and projections are mainly restricted to countries in the European Union. The new 'liberalization policy' regarding generation and distribution of electricity has added an extra dimension to the exploration of renewable energy sources.

In spite of all the advantages, renewable energy modes are unable to capture a sizable market share, mainly due to their high cost of production/kWh. However, the authors say that large hydro and wind energy (in selected locations) have already reached competitive production costs. Subsidies extended to renewable sources will only be reduced in the course of time, but it is expected that improvements in technology will offset such obstacles. Still, the authors' projection that primary renewable will have a share of one quarter to half of energy production by 2030 seems to be too optimistic and requires more statistical evidence. Renewables find advantageous applications in small islands and other isolated places, having 2-3 percent of Europe's total population. For grid-connected applications also, it has its own applicability in spite of the variability.

A chapter each is devoted for four different energy sources, i.e., hydro, wind, SPV, and ocean energy. The authors' contention that solar thermal does not have a viable potential in Europe seems to be doubtful, at least for some regions in southern Europe. As far as hydro power is concerned, it already accounts for 13 percent of European electricity generation, and potential for additional generation exists in southern Europe, Austria and Sweden. Potential exists for small hydro (less the 10 MW) generation also in most countries, and this mode has little environmental impact. The book gives an exhaustive coverage on wind energy. Countries such as Denmark have pioneered wind power research and manufacture of wind turbines since the seventies. Projections made based on the installed wind energy capacity in 1994-96 envisage a substantial increase by 2000 with Europe leading the other areas of the world. While most of the important aspects of wind energy are covered in the chapter, a brief write-up on different types of rotors and their efficiencies would have made the chapter more comprehensive.

Solar electricity using photovoltaic technology is another area that is fast developing and gaining widespread acceptance. However, its share in the total power generated remains quite low, due to high cost of production. Even then, the projection made for SPV, as 0.1 percent of European electricity demand by 2010 seems to be too low. Due to intensified R & D efforts, a progressive reduction in the cost of photovoltaic electricity is envisaged in the coming decades. Energy from tides and waves is yet another method of renewable energy generation. This mode suffers from the disadvantage that large-scale units are not possible, and the cost of generation is quite high. The book gives a detailed data regarding potential sites in Europe for generating tidal energy and wave energy.

A chapter is devoted to the integrated electricity systems in Europe. Obtaining power from northern Africa via trans-Mediterranean cables is one future possibility. A similar possibility exists of obtaining power from Iceland and Norway and providing it to nearby countries in the region. The last chapter, devoted to conclusions and policy implications, mentions the holistic value of primary renewables such as environmental benefits, structural benefits, etc., and covers topics including the paradox of scale in energy generation, policy tools, and future projections.

On the whole, the book has done justice to the subject to which it is devoted. Cost figures expressed in euro-currency are still unfamiliar to readers, as it has not come into existence; hence dollar or pound figures would have been more understandable. Maybe because this volume is part of a series of books, the subject index and references are missing at the end of the book. If these had been provided, the book would have been "self-contained."

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***International Comparisons of Electricity Regulation***, edited by RICHARD J. GILBERT AND EDWARD P. KAHN. (Cambridge, UK: Cambridge University Press, 1996, reprinted 1997), 500 pages. ISBN 0-521-49590-3.

This book is an intelligent collection of economic papers addressing international reform and restructuring of the electric power industry. It contains eleven chapters, the first of which is an introduction by the editors. The remaining chapters address groups of countries, Scandinavia, South America, and England and Wales, and individual countries, the United States, Japan,

Germany, New Zealand, Canada, France, and Yugoslavia. The editors have ordered the chapters starting with the "big experiments" (e.g., England and Wales), then the mixed systems (e.g., Japan), and finally government ownership, which includes countries that are moving from government ownership to privatization (e.g., New Zealand) and countries that still have substantial government involvement (e.g., France).

These papers, written by academic investigators, combine standard theoretical and empirical approaches. The authors are the usual suspects and include David Newbery, Richard Green, Jean-Jacques Laffont, and the editors themselves, who write a paper on the U.S. Each paper follows a common pattern of organization, which allows for ease of comparisons across countries. They provide a historical overview, a discussion of the current state of the industry and its regulatory structure, an appraisal of the economic performance of the industry (e.g., productivity, pricing efficiency, investment efficiency, X-efficiency), and an evaluation of current regulatory reform. The papers do not limit themselves to narrow economic issues but also consider institutional structures, national energy and industrial policies, stakeholders, and countries' endowments.

The papers are replete with detailed charts and tables of electricity prices, ownership structures, consumption statistics, energy prices, and other useful data. For analysts who need to find quickly such information, this book is a good starting place, although it is, of course, not an exhaustive reference. Comparisons of data across countries, however, must be done by flipping between chapters except for reserve margins, real electricity prices, and relative prices between industrial, commercial, and residential customers, which the authors tabulate in their introduction.

The editors briefly summarize their conclusions in their introductory chapter. One conclusion, which is not surprising, is that the electricity industry in almost all countries has lower industrial rates than commercial and residential rates. In addition, residential customers are typically cross-subsidized because of their aggregate political influence. The editors also conclude that it is difficult to detect differences in performance that result from ownership type, and that the role of government control varies considerably across countries.

The editors also find that privatization in electricity is accompanied by structural change, which suggests that it is not solely motivated, as it has been in other privatized industries, by the prospect of generating revenue for the state. Whether the motivation behind the accompanying structural change is governments recognizing that productivity gains will come from competition, or investors believing that a competitive structure is more profitable to them than a regulatory one, it is not entirely clear at this point. The editors also point out that it is not certain whether or not privatization and structural changes will spread to other countries or will be confined to a dozen or so nations.

All of the papers are high quality, informative, and insightful. Individual favorites are probably a matter of taste and research interest. I found Laffont's paper on the French industry particularly interesting. The French industry has historically emphasized marginal cost pricing, pursued a fuel mix strongly motivated by national objectives, and has a "contractual" relationship between *Electricité de France* and the government. While the French approach is infrequently mentioned in restructuring discussions, either as a model to pursue or avoid, these three elements are part of many reforms, and the fact that they are so prominent in the French electricity industry may enable France's experience to be useful in other contexts.

The electricity industry has spawned many collections of papers, and Gilbert and Kahn have assembled an outstanding book. The papers are organized, thoughtful, and accessible to a wide range of informed readers, not just economists. The discussion comparing countries is abbreviated, but to the point. Further fleshing out of such comparisons, however, may be an exercise best left to the reader, and Gilbert and Kahn along with the chapters' authors have successfully laid the groundwork for such an endeavor.

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***Power Structure: Ownership, Integration, and Competition in the U.S. Electricity Industry*** by JOHN E. KWOKA, JR., (Kluwer Academic Publishers, 1996) 189 pages, ISBN 0-7923-9843-2.

Kwoka's book presents a comprehensive and timely study of the electric utility industry. He examines the impacts of several of the crucial issues bearing on the cost and price performance of the electric utility industry. These issues are nothing less than the ownership of the firm (private vs public), vertical integration, and competition. To accomplish this task, the author has assembled a large and diverse data set which is essential for addressing these issues simultaneously. The study's findings produce several new insights and ample reason to pause and reexamine much of what we think is true, before plunging headlong into radical restructuring of the electric industry in the U.S. and abroad.

This book is organized in the following way. The first two chapters provide the institutional background on electric utility industry. Chapter 2 in particular provides an informative discussion of the theories, operation,

accounting practices, and the cost performance of publicly owned electric utilities relative to private firms. Chapters 3 and 4 discuss cost performance criteria, the cost model, and the results. The cost analysis is the focal point of this study, and as the author notes, the most important dimension of performance. This section discusses the performance criteria of economies of scale and scope (vertical integration), the development of the cost function, and relevant variables. Among the numerous control variables are those that are central to the issues at hand; ones for ownership type, measures of utility services that can be vertically integrated, and indicators of competition (e.g., utilities that share service territories).

An analysis of the relationship between costs, ownership, integration, and competition and the pricing behavior of utilities is provided in Chapters 5 and 6. Demand and supply equations are developed and estimated to explain pricing behavior. Prior to the conclusion, a chapter discusses the politics and economics of existing ownership arrangements, and how they might change.

Kwoka's principal findings are interesting, often surprising, extremely timely and important to the ongoing privatization and restructuring debates. On the issue of ownership, the author finds that publicly held firms have significantly *lower* prices than their privately-owned counterparts. A portion of the difference is due to lower costs (*after* accounting for subsidies), and a portion to a smaller markup. The majority of this benefit is focused on residential distribution services. This is explained in terms of the proximity and political responsiveness of the decision-makers in public firms, and not the failures of the private regulation. Kwoka has also reported similar conclusions in another publication (Kwoka, 1995).

The benefits of vertical integration (the joint production of generation output and the transportation of power for sales) is another focal point of this study. The author finds significant cost savings for vertically integrated firms, particularly when firm size and the percentage of self-generation increases. Small firms do not appear to benefit from economies of vertical integration, and benefits drop off for very large firms as a result of increasing diseconomies of scale in generation. The principle conclusions to be drawn here are: (1) small firms may specialize (e.g., distribution only) without a cost penalty (as evidenced by the superior performance of the small publicly owned utilities), and (2) a substitute for vertical integration should be found if it is deemed essential to disintegrate the industry.

The evidence on the benefits of competition is less convincing because of the small number and scope of cases where competition occurs. What evidence does exist, though, clearly indicates that competition results in improved cost efficiency and lower prices. The author, above all, calls for the introduction of competition wherever feasible in the industry, being mindful of course, to maintain vertical integration efficiencies, if possible.

Although this study has elevated the level of sophistication of empirical studies on the electric utility industry, there are several areas which could benefit from further analysis. Among these is the need to expand the data set to include a separate measure for transmission service and observations reflecting generation-only companies. The reasons for not including them in this study are unclear. Analysis involving these additional measures would enrich the restructuring and privatization debates.

Two other areas could benefit from further discussion. These are *causality* and the *cost function*. By including specialists such as distribution-only companies both public and private, and analyzing them together with vertically integrated utilities of mixed ownership, the underlying assumption is that all entities face a common set of goals and production technologies, and then *choose* to become one kind of firm or another, based on the economic conditions they face. Although some discussion is given to how these choices are really made near the end of the book (a mixture of historical precedent, the current political and regulatory institutional framework), more needs to be said about this, both when selecting the form of the cost function and when interpreting the results.

The author defends his choice of the quadratic cost function used in this study. However, the choice is more contentious than he implies. The quadratic cost function does a fine job of allocating costs to the various dimensions of output and deals with the "specialists" observations just as the author intends. Given the goals of this study, it may be the best choice. However, Kwoka's quadratic cost function has a fundamental flaw that weakens the theoretical foundations of his results, including the findings on economies of scale and scope. A cost function should explicitly recognize that the costs of production are the result of input demands and market prices. Consequently, the function should behave accordingly, namely be linearly homogeneous and concave in market prices, properties that are not necessarily imposed by his quadratic. More importantly, an economic cost function forces a certain discipline on the researcher, requiring an effort to understand about how inputs are related to outputs. Indeed, the use of the properly specified cost function in empirical analysis has often resulted in a greater understanding of the underlying production process.

One example of this "lack of discipline" is the handling of purchased power. Arguments can be made that purchased power is an input (as an alternative to generation assets), or that it is an output (as part of power supply to the sales functions), but it cannot be both or neither, as implied in this study. Another way to view this is to recognize that generation output is treated here, and in the earlier referenced studies, as an exogenous output term along with sales volume. Although this may be true of sales, generation output (particularly when measured in kWh) should be determined in a cost minimization process, competing with outside sources of power in both the long run and in the short.

This form of competition has been, and will continue to be, on the rise. Thompson, et al. (1996) presents a different treatment of the generation output issue.

In summary, the discussion and analysis in this book has significantly expanded the understanding of cost and pricing performance of the U.S. electric utility industry, and has provided important insights into the main issues facing the industry here and abroad. I highly recommend this book to readers interested in the future of the industry.

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## **References**

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