Book Reviews

Jonathan D. Aronson and Peter F. Cowhey (eds.), *Profit and the Pursuit of Energy: Markets and Regulation* (Boulder, Colo.: Westview Publishing Company, 1983).

The contributing authors of this book tackle an important and perplexing problem—that of analyzing the strategies and actions taken by private companies and governments when faced with uncertainties in world energy markets. The book is organized into three major sections: (1) World Trade in Oil, Natural Gas, and Coal; (2) Government Regulation and Intervention; and (3) Market Competition and Risk. The papers in these sections focus on investment and marketing uncertainties, including government entry and interventions. Means for addressing those risks, such as financial instruments and insurance, are also treated.

The book has a number of strengths and weaknesses. As a whole, there are several interesting insights to the changes in the structure of the world oil market over the last decade. Some implications of these trends for the future are indicated as well. However, much of the material, though well-organized, is purely descriptive and undifferentiated from what is available elsewhere. Also, this book has not escaped the bane of most edited volumes—the substances of the different papers are not woven together well. Thus the reader must be selective in the choice of papers, depending on one's previous background and interest, but one cannot expect to draw easy linkages among all the papers.

An important contribution made by the book is the very interesting discussion, in several of the papers, of government perceptions of energy "problems," the resultant policy decisions and actions, and the effects of these actions on private firms. Several of the authors integrate microeconomics and risk analysis within a political-science framework in treating these government–private sector strategic interactions. For example, the restructuring of the role of the major private oil companies in the last decade is conventionally thought to weaken those firms, if not signal their demise from power in the marketplace. An insightful discussion of this restructuring is presented in the first chapter, "The Engineers and the Price System Revisited: the Future of the International Oil Corporations," by Peter Cowhey. Yet, according to this book, the majors may gain new, but implicit, strength from this restructuring process. This strength derives from more flexible and fungible investments, diversification into nonpetroleum activities, and insulation from short-term political pressures. Specific examples of this process are given, such as discussed in the fourth chapter, "Policy and Politics of North Sea Oil and Gas Development," by Merrie Klapp. However, the private sector is still unlikely to capture a significant portion of the rents.

Another segment of the analysis in *Profit and the Pursuit of Energy* discusses how the various government agencies of different countries set energy policies. The visible and politically sensitive nature of this policy formulation process exposed it to many powerful non-oil-interest groups. The major private oil companies were awash with the effects of the resultant "policies" and government actions, and these effects were strong input to the ongoing restructuring of the world oil industry.

At several points in the book, market failures are analyzed. Here the constructive role of government is discussed, and alternative policies presented. An interesting example is financial innovation applied to synfuels as discussed in the sixth chapter, "Financing Synthetic Fuels Investments in the United States: Public Support and Private Investment," by Svi Adar and Tamir Agmon. However, this type of policy discussion is not linked within the book with those policy actions mentioned above.

On balance this book is worth reading by both energy industry practitioners (public and private sector) and academicians. However, the reader should choose only those papers of personal interest because, unfortunately, all the papers are not intertwined.

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H. J. Brown and T. R. Strumolo (eds.), *Decentralizing Electricity Production* (New Haven: Yale University Press, 1983).

In reviewing any edited book, a reviewer is not reacting to the content of the individual chapters, but to the overall themes of the book, the choices of what material to include and exclude, and how the style of the book compares with other similar books.

This is a prescriptive book, which advocates a future that would be much more weighted toward alternative energy sources than the past. Thus, there is a lot of political rhetoric mixed in with analysis. The editors make no bones about this, as indicated by the following passage from the preface:

> The most general question we address in this work is, "If we were to create a decentralized electrical energy system, how would it work?" As planners we concerned ourselves with only two general constraints: what is technologically possible (using existing knowledge and tools) and what is ecologically possible (considering existing conditions). Economic viability is something society creates after deciding what it wants, not something that should determine its

needs. Making something economical is a policy problem. The question we need to ask is, "How do we do it?"—not "Should we?"

Because most energy consultants don't agree with that general proposition, they will probably find a lot to disagree with in this kind of noneconomic advocacy book.

Perhaps the broader question should be raised as to "What is wrong with having such books advocating alternative energy technologies?" There are a lot of them—for example, P. P. Craig and M. D. Levine (eds.), *Decentralized Energy* (Westview Press, 1982); A. B. Lovins and L. H. Lovins, *Brittle Power* (Brick House Publishing, 1982); and M. Messing, H. P. Friesma, and David Morell, *Centralized Power* (OGH Publishers, 1979). Furthermore, the advocates of big nuclear, big coal and big synthnetic fuels technologies turn out a steady stream of advocacy books on their side. Certainly, alternative energy technology enthusiasts deserve equal time from a fairness point of view.

From an energy economics point of view, however, there is something offensive about the rhetorical battles between big-technology advocates and small-technology advocates. Economics and economists should be the traffic cops, and technologies merely the vehicles by which economic efficiency is achieved.

Also, it is saddening to see small-power advocates engaging in political rhetoric at a time when the real economic forces are moving gradually in their direction. In this context, use of noneconomic arguments can have a less favorable impact on informed public opinion than if the effort were spent on analyzing the newly emerging market niches that small power may fill.

There are two rather fundamental issues that are overlooked in the chapters of this book. First, much space is devoted to examining the recent disappearance of scale economies at the upper end of the size range of power plants, with the inference being that small-power technologies are or shortly will be competitive. This ignores the fact that considerable scale economies still exist at the lower end of the size spectrum, and represent an important obstacle for small power technologies to overcome. Second, the term "decentralized technologies" (i.e., small technologies) is used as if it were synonomous with "renewable resource technologies." Of course there are small-power technologies (such as fuel cells, combined cycle plants, and fluidized bed combustion) that may turn out to have all the economic advantages of smallness, yet not have the renewable characteristic. If different resources or technologies are otherwise equivalent in overall social costs (e.g., in security of supply and environmental impact), economics doesn't provide any basis for preferring renewables over nonrenewables.

The material in this book comes from the 1972–80 era. Thus, much of the argument for alternative technologies is in the abstract. From 1981 onward, when state regulatory commissions actually got down to the practical issues of avoided cost pricing and other issues involved in integrating small-power producers into the system, many of the issues treated in an abstract manner in this book had to be solved in a pragmatic, real-world setting. There is probably more to be learned from the record of those hearings than from the somewhat utopian essays of an earlier era.

There are redeeming features in this book. In a piece entitled "Restructuring the Electric Utility Industry: A Modest Proposal," David Huettner makes the impor-

tant point that, if economies of scale disappear at all points along the range of power-plant sizes, then there will be no justification for continuing to treat the generation end of the industry as a regulated monopoly.

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Peter R. Odell and Kenneth E. Rosing (eds.), *The Future of Oil: World Oil Resources and Use* (London: Kogan Page, 1983).

According to this book, oil is not scarce and world oil production will continue to grow, at least until the second decade of the twenty-first century (p. 199). A basic premise that allows the authors to reach this conclusion is that the world's conventional crude-oil resource base is much larger than the petroleum industry has publicly stated it to be. They argue that the industry has conspired to make oil seem scarce by not exploring for it in Third-World countries (pp. 30–32). International oil companies, they contend, downgraded the potential attached to these countries, when nationalization or loss of control of production seemed likely and acceptable concession agreements became difficult to negotiate.

By assuming a sufficiently large resource base and relatively slow growth in demand, the authors reach their conclusion that crude-oil production won't peak until well into the twenty-first century. Odell and Rosing reject the industry consensus estimate of ultimately recoverable conventional crude oil of no more than 2,000 billion barrels (p. 109) as too low. To date, about 1,170 billion barrels have been found, of which 450 have already been produced and 720 are in reserves. B. F. Grossling's estimate of 6,000 billion barrels is preferred by the authors, although they also mention Styrikovich's estimate of 11,000 billion barrels. They also regard 2,000 to 5,000 billion barrels of oil from unconventional sources as potentially available. The authors subjectively assume an 85-percent probability that the total recoverable oil-resource base will be at least 5,000 billion barrels (p. 175). They also state only an 18-percent probability that growth in oil consumption will exceed 2.25 percent per year (p. 174).

The book has six chapters and an index. Chapter 1 introduces assumptions regarding the resource base. Next, their world oil-production simulation model is presented. Chapters 3 and 4 (about one-third of the book) document the change in oil companies' public statements regarding future world oil-production possibilities. Chapters 5 and 6 present the results of the model and implications.

The authors seem to feel that their conspiracy theory relieves them of having to present any type of scientific evidence for their resource-base estimates. Data on productivity of exploration (petroleum discovered per unit exploration) show a 6,000-billion-barrel estimate of ultimately recoverable conventional crude oil to be

impossible. The petroleum industry is not a homogeneous industry. National companies from both communist and noncommunist countries have objectives that differ significantly from those of the major profit-seeking oil companies. A conspiracy by so many independently controlled companies of the type suggested by Odell and Rosing to make oil scarce is remote.[1]

Most of the world's oil is concentrated in only a few basins and relatively few fields. Approximately 400 of the world's 600 basins have been extensively explored, and only 160 of the 400 have yielded commercial discoveries. Although only 25 of these basins have had discoveries of at least 10 billion barrels, these 25 contain 86 percent of the total hydrocarbons discovered. The Persian Gulf accounts for about 40 percent of all such hydrocarbons. Giant fields (of at least 500 million barrels or 3 trillion cubic feet of natural gas) represent fewer than 1 percent of the world's fields but account for 70 percent of current production—and 75 percent of proved reserves. Thus, for the world's conventional oil-resource base to be of the magnitude that Odell and Rosing think is likely, several basins the size of the Persian Gulf must have been overlooked. Most areas of the world have had some exploration. Indeed, very little exploration effort (even with primitive methods) was required to find the vast accumulations of oil in the Persian Gulf.

Odell and Rosing expect oil obtained by improved recovery techniques and unconventional oil substantially to augment the recoverable oil resource base. One example of improvements in the recovery of conventional oil is the steam floods used to recover heavier California crude oil. The authors neglect to point out the cost of the required intensive in-field drilling (typically for every 3 barrels recovered, 1 barrel is used for steam generation). In fact, the entire study ignores anything having to do with economics, both on the demand and supply sides. The world has a large quantity of unconventional crude oil. However, the authors assume that the mere existence of this resource implies that it can and will be produced as needed. Unconventional sources typically are not producible at rates comparable to rates of production of conventional sources. Like a hydropower plant that represents a vast amount of total energy, these resources are deliverable in relatively limited quantities per unit time.

Although this book is supposed to be a revision, some of the general criticisms of the first edition still seem somewhat appropriate (see Dunnington, 1982). In short, the assumptions and methods used in this study have little scientific or economic basis in fact. Consequently, their results do not inspire confidence.

1. Both the U.S. Geological Survey and the U.S. Department of Energy's Energy Information Administration have for several years conducted assessments of discovered and undiscovered conventional oil resources. In a paper presented to the 1983 World Petroleum Congress entitled "Distribution and Qualitative Assessment of World Crude-Oil Reserves and Resources," by C. D. Masters, D. H. Root, and W. D. Dietzman (U.S. Geological Survey Open-File Report 83-728), principals in these programs estimate the most likely value for *ultimate recoverable conventional crude oil to be 1,718 billion barrels*. R. F. Meyer of the U.S. Geological Survey estimates recoverable oil from unconventional sources, such as heavy oil and tar sands, to be about 600 billion barrels (see R. F. Meyer, V. A. Kuuskraa, and E. Hammershaim, 1983, "World Resources of Heavy Oil and Tar Sands." pp. 89–144, in *Papers of a Symposium on Synthetic Fuels from Oil Shale and Tar Sands*, published by the Institute of Gas Technology).

Dunnington, H. V. (1982). "Review of the Future of Oil and Simulation Study of the Inter-Relationship of Resources, Reserves, and Use, 1980–2080." *Energy Exploration and Exploitation* **1**, 2:145–52.

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Letter to the Editor

To The Editor:

A feature story in the August 8, 1983 *Oil Daily* reported that the Synthetic Fuel Corporation (entering its fourth year) had committed money to only one project and dissident directors were stating that "no long-range strategic plan exists for meeting the goals of the SFC chartering law. . . ." Ten years have passed since the oil embargo, yet the United States is still waiting for its first operating plant to demonstrate production capability and provide cost information about producing liquid and gaseous fuels on a commercial basis from sources other than conventional petroleum reservoirs.

The present market abundance of oil and gas does not by any means alleviate concern over the status and stability of energy research. The current dismantlement of a good part of our energy research establishment is not costless. Right now, we are hoping we are not saddled with high-cost synfuel capacity, but in the not-too-distant future we may well need another round of private and public expenditures to revitalize it.

I feel that social scientists haven't directed enough attention toward a better understanding of the research process in general and toward energy policies and practices in particular. Richard Schmalensee's "Appropriate Government Policy toward Commercialization of New Energy Technologies" in the April 1980 *Energy Journal* or R. R. Nelson and R. N. Langlois's "Industrial Innovation Policy: Lessons from American History" in the February 18, 1983, *Science* are recent exceptions. But in general, energy economists have not devoted any continuing analytical and prescriptive effort to this subject.

On January 11, 1983, the Capital Chapter of IAEE held a workshop to discuss "Synfuels: In the 20th Century?" Once again, the difficulties of understanding the process of research, development, demonstration, and commercialization, and the question of government involvement, became apparent. The message was clear: we often stray from effective and efficient channels in our research efforts to advance energy technology. The Fifth North American IAEE meeting committee placed R&D on its preliminary program plan but a session did not materialize.

I suggest that in the near future we dedicate one of the *Journal*'s Energy Policy Forums to some lively discussion of technical research and research policy applied to energy. Perhaps the San Francisco program committee will be able to make another effort to uncover ongoing empirical energy research and provide a platform for discussion, as a start on a continuing dialogue.

I am aware some IAEE members feel that energy R&D is not broken, so we

shouldn't try to fix it. In reply, I urge that it does need *maintenance* overhauling. Energy RDD&C may not be different from RDD&C in general. Perhaps energy firms should be able to cope with the huge investments required and the ensuing high risks, on a business-as-usual basis. I recognize the merit of careful analysis of public costs and benefits prior to government intervention as the prudent pathway to follow. I also respect the caution flags that Nelson and Langlois raise, and the merits of Schmalensee's cogent arguments against the subsidization of the commercialization phase of the RDD&C process.

But I find many questions yet unanswered. Among them are (1) handling the external benefits (spillover effects) from energy RDD&C; (2) the barriers to entry posed by minimum investment required to test new energy technologies; (3) concern over the short time horizon of both our private and public investment decisions; (4) reluctance of the public sector, both administrative and legislative, to provide funds for research unless there is a visible and predictable return; (5) how to insulate publicly funded research from the influences of regional and resource preferences of the electorate and the dislocations of a change of the party in power; (6) the tendency of basic research to become a captive of entrenched members of the scientific community with restricted outlooks and narrow goals; (7) problems of transferring the fruits of one stage of RDD&C to the next; and (8) the shape of the learning curve, given the widespread underestimation of the cost of commercial prototype plants.

Not all these problems fall exclusively into the domain of economic analysis. However, if the IAEE membership were to initiate the discussion, other professions could join in later. The time to get started is overdue.

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